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The Farmer's Digest

Volume 5 August, 1941 Number 4

There's Probably a Good Farm Underneath

Condensed from New Jersey Farm and Garden

Lewis W. Barton

"I'M not making money growing potatoes on the worn-out farm that I went broke on up in Centre County. My big crops are now being grown on the *good farm underneath it.*" So said Prof. Nixon, godfather of the Pennsylvania potato industry, scientist and agricultural philosopher. His statement brings home what our own experiment station people have been trying to put across for several years. Even in the times of our great-grandfathers in the early 1800's subsoil plows were known and used by progressive farmers. A narrow plow with a huge beam followed the regulation plow in every furrow, thus stirring the soil to a depth of probably fourteen inches. Think of the labor involved when all the plowing was done by a plodding ox team!

Deep tillage is a progressive practice which we should use to increase our yields, yet one which has been known and used to advantage for generations. Then, too, there has been considerable confusion among farmers about "deep tillage," as Prof. C. H. Nissley, of the New Jersey Experiment Station, likes to call it.

There are really three distinct problems involved, which need to be distinguished carefully. First, and probably most prevalent, is the plow sole problem. This is caused by plowing to the same depth, especially with tractors, year after year. The soil in the bottom of the furrow, often more clayey than the topsoil anyhow, is packed hard as concrete. Roots cannot penetrate it. Rain does not drain down through it in wet periods, causing excessive runoff and erosion. When dry spells come, the subsoil has not been able to store the excess moisture, and the impervious layer prevents any water from reaching the top layer because capillary action is shut off.

We found severe cases of plow sole on some of the sandiest fields on our farm. Determined to do

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something about it, we purchased one of the subsoilers (developed by Prof. Nissley at New Brunswick) and attached it to our tractor plow. It breaks the plow sole to a depth of as much as nine inches below the furrow bottom. We left a small strip in the middle of one field as a check. Every time it rained or we irrigated the field, this strip stayed muddy longer, demonstrating that the hard layer prevented the soil from taking up the moisture as fast as it should.

You can't expect immediate results, but this type of tool will do much to correct a condition which has been developing for years. We now use it in most of our vegetable fields. It adds considerably to the draft of the plow, probably about as much as an additional twelve-inch plow.

We should be raising our crops in twelve to eighteen inches of soil, not a mere four to six inches. Deep cultivation practices induce deeper rooting of plants, making available to them the nutrients and the moisture in at least twice as large a volume of soil. Deep-rooted plants don't fall over when the ground is wet. This applies especially to eggplants, peppers and corn.

Deep tillage improves capillarity and makes more water available in periods of drought. It increases aeration, thus helping the bacteria which decompose organic matter, make nitrogen fertilizers available to plants, and aid legumes in fixing nitrogen from the air. In many cases an improved bacterial situation is needed far worse than more fertilizer.

Most plow soles contain materials toxic to roots and to bacteria. Even though the layer is not very hard, root tips die as soon as they enter this layer, thus making a "shallow" plant that suffers from dry weather and starvation.

One of the worst problems on our farm is how to handle land from which we have just removed fruit trees. There are rows of stump holes, many of them with snags of large roots left in them. A certain amount of sod, poison ivy, honeysuckle and other tough material inevitably grows in old apple orchards. This material is almost impossible to root out in one season. We can't plow deeply because of roots. Even Prof. Nissley's subsoiler won't stand the punishment of plowing in this kind of land.

There is a strip of land in every middle which is packed hard as the "super highway" from driving sprayers over it for twenty to thirty years and from hauling out fruit. This strip cannot be plowed deeply except in extremely wet weather. We have now adopted the practice of having this land treated with a Killefer subsoiler, a huge hook which goes down twenty-two inches and

tears up roots, hardpan and all. A heavy twenty-two-inch disc will then prepare the land without plowing at all. Few farmers have tractors which will handle a heavy subsoiler, but there are several farm power contractors who will do the work at a reasonable price. The saving in the cost of plowing under these difficult conditions will, we believe, nearly pay the bill of the contractor. We tried both our crawlers hitched in tandem to do some of this work, but found it is not a very practical way of getting much work done.

In 1939 we removed a cherry orchard from a six-acre field which is gravelly clay loam, mostly of the Collington type. The cherries had done well, but the ground was very hard. The rye and vetch cover crop grown that season suffered from dry weather, and we were not able to plow the piece all summer. Yet the land is not suited to vegetables and we wanted to put in a young orchard. It looked like an impossible spot for young apple trees, so we put the problem up to County Agents Charles Gould and Dan Kennsler and to Prof. Farley. They called in Prof. Nissley, the "subsoil doctor." He brought his demonstration Killefer down on his trailer and we tried it in several strips. It brought up chunks of subsoil as hard as bricks from a depth of twelve to twenty-two inches. This soil, when analyzed, proved fertile enough. It wasn't even sour, but was practically impervious to roots or to moisture.

In the winter of 1939-40 we borrowed the machine again, and using two crawler tractors, about fifty horsepower in all, prepared the field for planting the young trees. The rows were staked out in advance, and we made a trip down each side of the row, with the "hook" down to twenty-two inches. This loosened up the soil so the trees were planted easily. They made a good growth last season in spite of severe drought conditions which checked bearing trees in the same area.

Drainage Problem Solved

During the wet fall of 1939 we lost a number of one-year-old apples in another orchard. The soil is light and easily worked, has plenty of organic matter and lime and is almost an opposite of the "tough spot" described above. Yet in several parts of the field, wet spots developed, the heavy rainfall wouldn't soak away, and about twenty-five perfectly healthy trees died of "wet feet." Here was a drainage problem on a piece of high, light land which we always considered well drained.

Again we used the Killefer subsoiler, this time running about three feet from each side of the young trees with all three teeth on the machine. In the spots

where the trouble had been worst, we made several extra trips in every middle. Not a single tree died in this field in the season of 1940, even though we had many more heavy rains than in 1939. One of these, the Labor Day flood, registered eight and a half inches in twelve hours and cut us off from the outside world, yet no pools remained in the field the following day.

These are only a few of the ways in which deep soil tillage can be applied to producing better crops in New Jersey. To this extent, we have had definite experience on our own farm.

Profs. Nissley and Tiedjens have developed many other uses for these practices. They demonstrated in 1937 that asparagus planted in furrows that were subsoiled and treated with a ton of limestone and 1,000 pounds of superphosphate per acre made almost three times the growth of that in untreated rows. This is probably a practice which can be more generally adopted when planting deep-rooted crops like asparagus and rhubarb. It should greatly reduce their tendency to "grow out of the ground."

Alvin String, of Woodstown, purchased a two-row middle breaker for making rows for his canning tomatoes. He attached one of Prof. Nissley's subsoilers to each of the plows. His soil was hard and tended to erode. He loosened the soil for at least six inches below the furrow bottom. The results were wonderful, not only in increased yield of tomatoes, but in preventing rain from running off and being lost to the crop. Erosion was greatly reduced.

It cannot be emphasized too strongly that all of us should study our own conditions closely. With the help of our county agent we can decide whether we have plow sole, a drainage problem, a tough subsoil or mineral deficiencies in the "good farm underneath." Then we can go about cultivating these riches intelligently.

Forage Beef

Condensed from Capper's Farmer

M. N. Beeler

BEEF as good as that which most consumers buy can be made on summer grass and winter roughage. That was indicated by a test conducted at the Missouri Experiment Station. One lot of steers fed only legume hay and silage during 2 winters, and grazed on excellent pasture during 2 summers, went to market at 1,156.96 pounds, graded "low good," brought $11, and dressed 60.3 per cent. They would have broken even at a home selling price of $6.61.

During the 163 days of the second grazing season they had put on 204.59 pounds apiece. Another lot, handled the same way, gained 237 pounds apiece to weigh 1,198 pounds at the end of 176 days of the second grazing period.

These were the last of a lot of 80 high-quality Texas steers, purchased as calves the fall of 1938, and put on test to determine whether acceptable beef could be made from grass and roughage; or what maximum of such feed could be used in turning out a carcass that would grade "medium" or "good."

"With development of soil conservation consciousness, which involved a decrease in corn acreage and a consequent increase in grass and small grain, it became desirable to know to what extent such crops might be used in making meat which would be acceptable to consumers," said E. A. Trowbridge, head of the Animal Husbandry Department. "Inasmuch as some 75 per cent of the federally inspected beef comes from carcasses which grade "medium" or "good," it is evident that those grades are proving generally acceptable to consumers. Hence they became our standard, and the experiment contemplated that the various lots of steers would be sold when they had reached those degrees of finish."

The Department of Field Crops, having developed cropping systems, 1- and 2-year rotations of legumes and small grains adapted to rehabilitating depleted acreages, was interested in the test because, as W. C. Etheridge, head of the department, said: "We want to know how extensively this system of cropping can be adapted to livestock production. If the feeds produced under the system can be utilized in making good beef without corn or with less corn

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than the customary requirements, then its effectiveness and its acceptance will be broadened."

Objectives of the investigation, then, were:

1—To determine whether the system might be used in producing beef that more people could afford to eat.

2—To develop a means whereby the man who was trying to conserve his soil could utilize with beef cattle the crops best adapted to that purpose.

3—To discover a less speculative method of beef making by increasing the farm-made gain and by using more forage.

4—To test the advisability of grain finish for cattle which have been carried for progressively longer periods on high-grade pasture and roughage, either as a means of insuring the desired grade or increasing returns.

The 80 Hereford calves averaged 415 pounds delivered. The experiment was planned to cover 2 winters of feeding roughage and 2 summers of excellent pasture, with lots of 8 steers selected from the main group at intervals for grain finishing. The first such lot was drawn December 20, 1938, soon after arrival, as weanlings; the second, when the calves were 12 months old, April 27, 1939; the third at 20 months old, January 2, 1940; the fourth, at 24 months old, April 22, 1940; and the fifth, at 26½ months, July 15, 1940. All these were grain fed for progressively shorter periods. The sixth lot, referred to in the opening paragraph, finished on pasture and roughage alone, was sold October 1, 1940. A seventh lot, 10 head, finished the same way and apparently taking the same grade, was held over for exhibition.

The first grained lot, the weanlings, representative of the whole, was put on full feed December 20, 1938, when they averaged 425.5 pounds. On corn, cottonseed cake, legume hay and corn silage they reached 799.4 pounds average in 168 days, graded as "low good," sold for $9 a hundred, and dressed 57.83 per cent. Necessary home selling price of this lot, to break even, feeds charged at current prices, would have been $7.79.

The rest of the calves were carried through winter on 4.09 pounds a head daily of alfalfa and lespedeza hay and 19.92 pounds corn silage. Up to April 27, 1939, when they went to pasture, they had gained 0.77 pound a head daily to average 523.5 pounds. At that time the calves were 12 months old and the second lot of 8 was selected for grain finish. They received, in dry lot, the same grain, supplement and legume hay ration as the first lot, but no silage, and averaged 856.7 pounds 130 days later, when they graded "high good," sold for $10.40, and dress-

ed 59.36 per cent. Necessary home selling price, to break even, would have been $8.22.

Remainder of the calves were put on 40 acres of wheat, rye and lespedeza pasture and 20 acres of bluegrass and timothy. The 40 acres was of low fertility but was under a small grain-lespedeza rotation recommended by the Field Crops Department, and furnished excellent pasture. Grazing consisted of small grain early and lespedeza from June to frost. That summer was the seventh pasture season for the field. Originally it had been seeded to lespedeza. Thereafter it was disked annually in preparation for small grain, with which was applied 150 pounds an acre of 20 per cent superphosphate.

When the steers were 20 months old the third lot was selected and put on grain feed, January 2, 1940. They had the same ration that was fed the weanlings a year before, and in 112 days increased from 768 to 1,045.87 pounds average. They graded "high good," brought $10.25, and dressed 60.81 per cent. Necessary home selling price, to break even, would have been $7.63.

In the meantime the main body of steers had been wintered on 6.5 pounds alfalfa hay and 34.62 pounds Atlas sorgo and corn silage a head daily. On this ration they gained 200.56 pounds apiece, compared with 277.79 pounds for the third grain fed lot, up to April 22, 1940.

On that date the third fed lot was sold, a fourth selected and the bulk of the steers turned out for the second summer of grazing. The fourth group, 24 months old, were shut in dry lot and received the same ration, corn, cake and legume hay, that had been given the second group a year before. In 77 days they put on 152.33 pounds to average 1,109.33 pounds, grade "middling good," sell for $10.50, and dress 58.17 per cent. Necessary home selling price, to break even, would have been $7.83.

The fifth group of 8, selected out of the grazing remainder of the steers when they were 26½ months old and weighed 1,035.12 pounds, went on dry lot feed of corn, cake and legume hay July 15, 1940. In 63 days they were up to 1,188.67 pounds, sold as "middling good" for $11, and dressed 59 per cent. Necessary home selling price, to break even, would have been $7.39.

Men who are interested in making beef on a minimum of corn will scrutinize the consumption of that grain by the various fed lots. The first consumed an average of 27.99 bushels a head in 168 days; the second, 28.78 bushels in 130 days; the third, 24.18 bushels in 112 days; the fourth, 20.6 bushels in 77 days; the fifth, 18.72 in 63 days. Altho the steers were older with each

successive withdrawal and thus capable of consuming more corn, at the same time fewer bushels were required to finish them to the grades indicated, which were within the higher of the 2 grades originally set as the goal.

Still more interesting is the record of 8 steers out of the roughage and pasture group, Lot 6, sold October 1, 1940, and the 10 steers in Lot 7 which were held over. The one attained the desired grade as previously indicated, the other was as good or better, and neither of them had received any grain, except what was contained in the corn and Atlas sorgo silage during the 22 months under test.

What of the beef produced by this method? After slaughter of each lot, a rib roast was selected and brought back for cooking and eating tests by the Department of Home Economics. The corn-fed lots might be presumed to have produced acceptable beef. Obviously the big question would be with respect to that made on forage. Of it, Professor Trowbridge said: "It was good beef, of such quality that the average consumer seeing it on a cafeteria counter, would order a serving. Personally, I couldn't determine much, if any, difference between it and that from the steers fed corn 60 days. It was of a grade, tenderness and flavor equivalent to the 75 per cent of beef which most of us eat."

Altho definite conclusions cannot be safely drawn upon the results of a single experiment, it is apparent that good beef can be made on forage alone, that a man who can grow but little corn or who prefers to grow none at all can compete in beef production with grain feeders if he will provide adequate pasture and winter roughage. It is apparent also that the man who desires to devote the major portion of his land to the small grain-lespedeza rotation and take his harvests by grazing, to be followed by a short feed, may do so with the assurance that he can produce desirable finish. Further, the more weight put on by forage, the less grain needed to make the required market grade.

For the man who can raise corn and is in position to buy what he needs, the results present other questions. Would he make more money to winter calves on roughage and feed them 130 days, as in Lot 2; winter on roughage, graze during summer and feed 112 days, as in Lot 3; or carry the cattle along as under the plan for Lot 4? In any of those cases he would be able to turn his original investment more quickly and his money oftener than if he followed the plan of finishing only on forage. In this case the question all hinges on price of feed and cattle. No safe conclusion can be drawn from the necessary home

selling price and the actual price received. An increase in value of feed, a decrease in price of cattle would change any advantage one lot exhibited over another.

Unquestionably the forage method is the least speculative way of making gains. Also the man who maintains a cow herd and produces his own feeders would have with this method a well nigh loss-proof project.

Go Slow on Plant Vitamins

JUDGING from letters I've been getting lately, many amateur gardeners are interested in Vitamin B-1 largely on account of the newspaper advertising this material has had of late. Unfortunately, many of the claims made for the materials are exaggerations.

Vitamin B-1 is commercially extracted from urine. Its close relatives, known as growth promoting substances, are all products of plant growth and plant decay. B-1, for example, is plentiful in young plants. It is made in the leaves and later on transported to the roots. Under certain circumstances, and particularly when Vitamin B-1 is lacking in plants, they will thrive and grow much faster when it is added to the soil.

There is, however, a much cheaper way of applying B-1 than buying it in small bottles at the rate of $1.00 per bottle. Some years ago a worker in Arizona was studying manure. He came to the conclusion that the benefit obtained from it, in addition to its content of nitrogen, phosphorus and potash, was almost entirely due to certain materials in the brownish liquids. These materials have since been identified as growth promoting substances. The easiest and best way for most of us to obtain Vitamin B-1 and other growth promoting substances is to apply manure or manure water, or even decaying peat.—*J. R. Hepler, New Hampshire College of Agriculture.*

Breeding and Selecting for Economy of Gains

Condensed from The Duroc News

J. C. Grimes

Alabama Experiment Station

IT has long been known that pigs vary considerably in their ability to make rapid and cheap gains. Even within the same litter and under similar feed-lot conditions some pigs gain much faster and cheaper than others. Just what causes these variations and to what extent they are transmitted is not well established.

An experiment was started at the Alabama Experiment Station in 1935 with the object of studying the transmission of factors associated with economy of gains in swine. As foundation animals, 15 pairs of Duroc hogs were purchased from leading breeders throughout the United States. An effort was made to obtain animals that were unrelated and of different types.

The 15 gilts were mated with 15 different boars, and when the pigs from these matings were old enough to wean the eight biggest and best litters were selected for the experiment. The other seven litters were discarded.

Each experimental pig, when 72 days of age, was placed in an individual pen where he remained until he reached a weight of 225 pounds. The pens were 6 feet by 18 feet and contained a concrete floor. All pigs were full-fed and an accurate record kept on each pig. When all had reached the given weight, the boar pig and sow pig which had made the most economical gains in each litter were kept for breeding purposes, and the boar pig and sow pig which had made the most uneconomical gains in each litter were likewise kept for breeding purposes. The superior gaining pigs from the different litters were mated to start eight unrelated superior strains and the inferior gaining pigs were mated to start eight unrelated inferior strains. The superior and inferior strains therefore had a common ancestry. This process of selection has been repeated thru four generations, breeding stock having been selected for economical gains in the superior strains and for uneconomical gains in the inferior strains. Matings have been

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made in such a way that practically no inbreeding has taken place.

Best Pigs in the Superior Strain

In the fourth generation, pigs in the superior strains averaged .14 of a pound heavier at birth and 6 pounds heavier at 8 weeks of age than the pigs in the inferior strains. *They also reached 225 pounds in weight 20 days earlier and required 20 pounds less feed for each 100 pounds gain than pigs in the inferior strains.* The average feed required for each 100 pounds of gain was 345 pounds in the superior strains and 365 pounds in the inferior strains.

Some bloodlines have consistently produced faster and cheaper gaining pigs than other blood lines in both the superior and inferior strains. The best doing litter in the superior strain, last year, required 37 pounds less feed for each 100 pounds of gain than the poorest doing litter in the same strain. There has also been a wide variation in economy of gains of pigs in the same litter. The best pig in one litter required 149 pounds less feed to make 100 pounds of gain than the poorest pig in this same litter.

In both strains there was a definite correlation between the daily feed consumption and the rate and economy of gains. Pigs which consumed the most feed daily gained the fastest and the cheapest. The most economical gains were made by pigs that reached 225 pounds in weight in about 6 to 6½ months.

Breeders Have Done a Good Job

Apparently breeders have done a good job in developing breeds and strains of hogs which are efficient utilizers of feed. The general practice in most herds has been to select for breeding stock the biggest and fattest looking pigs in the group at the time selection of breeding stock was made. Usually all the pigs were about the same age and had been eating out of the same trough. The pigs that were selected were bigger and fatter than their mates largely because they had greater capacity to consume feed and to use it efficiently. Breeders, therefore, while consciously selecting for type, size, and condition, were at the same time unconsciously selecting for economy of gains.

Type has not been considered in selecting breeding animals in this experiment. Selections have been made entirely on feed required per unit of gain. It has been noted however, that the fastest and most economical gaining animals have usually been those of the medium type; hogs with broad deep and medium short bodies. Slow and expensive gains on the other hand have been associated with hogs which were long of leg and which had long, narrow and shallow bodies.

Fifty-six litters of pigs have been raised in this experiment.

Three of these litters contained less than three pigs per litter. Seven litters contained from 4 to 6 pigs per litter; thirty-three litters contained from 7 to 9 pigs per litter; and thirteen litters contained from 10 to 12 pigs per litter. There did not appear to be any very close correlation between the number of pigs in a litter and the birthweight of each pig, nor in the rate and economy of gains. Pigs born in litters of about 5 to 8 made slightly better records than those born in very large or very small litters.

Four hundred forty-seven pigs were born alive and 369 of these were raised to a weight of 225 pounds. The records show that at birth sixty-seven of these pigs weighed less than 2 pounds, one hundred forty weighed between 2 and 2.5 pounds, one hundred five weighed 2.5 to 3 pounds, and fifty-seven weighed more than 3 pounds. The average birth weight for the four hundred forty-seven pigs was 2.56 pounds each. All of these pigs were out of gilts with their first litters.

The heavier pigs at birth were heavier at weaning age but most of the differences had disappeared before maturity was reached. There appeared to be no close correlation between the birth weight of pigs and the economy of gains. If a pig was strong and vigorous at birth he usually grew off rapidly and cheaply regardless of his size when born.

Influence of Sex on Economy of Gains

Of the pigs born during this experiment 184 have been male and 185 have been females. The male pigs average 2.59 pounds at birth and 27 pounds at eight weeks of age. The female pigs averaged 2.54 pounds at birth and 26 pounds at eight weeks of age. The male pigs required 207 days to reach 225 pounds in weight and consumed 367 pounds of feed for each 100 pounds of gain while the female pigs required 212 days to reach 225 pounds in weight and consumed 380 pounds of feed for each 100 pounds gain.

It is seen, therefore, that for pigs in this experiment the sex ratio has been about equal but that the female pigs have been slightly smaller at birth and at weaning age, have gained a little slower and have required a few more pounds of feed for each 100 pounds of gain than the male pigs. The slower and more expensive gains of the females may have been due, in part at least, to the fact that after reaching breeding age they were in heat frequently. During the period they ate very little feed and therefore made very little, if any, gain in weight.

Lespedeza Takes Over

Condensed from Successful Farming

H. M. Dail
University of Missouri

ENTHUSIASTIC lespedeza-growers, numbering 166,000 in the state of Missouri, wonder how they ever got along without this excellent crop, introduced into the state by the University Experiment Station in 1927. Its good qualities have also been heard of far beyond the borders of Missouri, and each year finds it progressing farther into the Northern states.

As a plant, lespedeza has none of the appearance of a king of crops. The height of mature lespedeza averages eight to ten inches. A thin stem supports a number of green branches and leaves. At a distance, the crop looks somewhat like a heavy green carpet. It is only when one walks on it and feels the thick growth underneath his shoes that he realizes the great amount of feed in the crop.

Adaptability is one of the chief features of this legume. On rock-strewn hills where farmers have difficulty in growing any crop successfully, lespedeza flourishes. And yet on more fertile soils it makes a dense and luxuriant growth, comparing well in total feed-production with such legumes as red and sweet clover. Even on acid soils where other legumes refuse to grow, Korean Lespedeza will provide considerable feed. Of course, the application of ground limestone will increase the production and feed value of the crop.

The experiences of farmers amply illustrate how the crop fits into the farm scheme. For instance, Gordon Edwards, of Chariton County, uses a wheat-lespedeza rotation on some of his rolling land. In an average year, his wheat crop will make a return of $13 an acre. This is followed by a crop of lespedeza which produces one and one-half tons of hay per acre worth approximately $12—the same year. This makes a total return of $25 an acre on land which in a good season would yield 25 bushels of corn per acre.

Frank Wallace, of Ralls County, has another way of obtaining revenue from this crop. He disks the lespedeza sod on a 20-acre field early each spring and seeds the field to oats at the rate of one to one and one-half bushels

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per acre. After the field is harvested, he turns some 100 ewes and their lambs on the field and leaves them there thru July, August, September, and the first part of October. Then he combines the seed, last year obtaining 533 pounds of seed per acre which sold at the farm for $3.35 per hundred pounds.

Lespedeza has filled a big gap in the pasture system of livestock farmers. About July 1, when bluegrass is entering its summer-dormant stage, lespedeza steps in to shoulder the grazing burden for the next 90 days or so. The type of feed it furnishes is indicated by the experience of John Coffey, of Camden County. His 51 beef calves weighed an average of 375 pounds when they were placed on wheat-lespedeza pasture this past summer. From April 1 to June 15 they grazed on a 40-acre field of wheat in which lespedeza had been seeded early in the spring. By the time the wheat was grazed out, the lespedeza also was made available to the calves and they fed on these 70 acres until October 1. At that time they weighed 680 pounds, which was a gain of 305 pounds for the six-month period. No grain was fed during that time.

The soil-conserving superiority of lespedeza over such intertilled crops as corn and sorghums is readily apparent. A dense root and top growth do much to retard the loss of soil and moisture following a heavy rainfall. Experiments showed that a lespedeza sod lost 1.6 tons of soil and 11.7 percent of the total yearly rainfall on an average slope while the loss on continuous corn plots under like conditions was 60.8 tons of soil and 30.3 percent runoff.

The effect of the crop on soil fertility is indicated by the experience of Carlo Gnemi, of Phelps County. On half of an eight-acre field he grew lespedeza for seven years while the other half was in a rotation of corn, small grain, and hay. He planted corn on both plots last year and estimated that the corn on the lespedeza side produced 50 bushels per acre but that which was on the remainder of the field yielded only 35 bushels per acre.

Altho it is true that lespedeza will produce a crop on soil incapable of yielding more than 20 bushels of corn per acre, it gives a very good response to applications of fertilizer. Results obtained by farmers and the experiment stations indicate that the fertilizer most efficient for use with the crop is superphosphate. This is usually applied to a small-grain crop ahead of the legume so that both crops will be benefited. The rate of application is approximately 150 pounds per acre. Many farmers swear by its use in their permanent pasture. For such purposes it is sown with

bluegrass, red top, or orchard grass—or combinations of these.

The Missouri College of Agriculture points out that quite often farmers wait too long before cutting their lespedeza for hay. If cut during the period from the middle of July to early August, the crop produces a very good hay. If cutting is delayed, some of the lower leaves of the plant fall off and the plant becomes stemmy.

Of course, it is true that at the period mentioned the lespedeza usually has not reached its maximum height. However, even if it stands only six inches above the sickle bar, a thick growth will produce a ton or more of hay per acre. Following this cutting a second growth of the legume will furnish pasturage for 60 to 90 days, and will mature enough seed to produce a stand the following spring.

The quality of green lespedeza hay is excellent when considered from the standpoint of either palatability or feed constituents. In order to secure a green hay, many farmers windrow the lespedeza just as soon as it has cured enough to be raked, and then shock it. One of the best ways of doing this is to use a buncher or windrow attachment on the mower bar.

Another mistake made is to allow seed to go unharvested and, as a result, find the purchase of seed necessary for new plantings in the following spring. Normally, the crop produces an abundance of seed if grazing is controlled to some extent during late summer. Gordon Roberts, of Holt County, harvested 233 pounds of seed per acre last October after his beef cattle had grazed the field throughout the summer and until a few days before the seed was harvested.

A combine is probably the best machine for harvesting seed, but a grain thresher or clover-huller may be used.

The future for lespedeza is indeed bright. Improved strains are now being tested that will extend the crop area far to the north of its present limits.

Synthetic Wood Ashes Require Boron

Condensed from Better Crops With Plant Food

A. R. Midgley and R. E. Dunklee

Vermont Agricultural Experiment Station, Burlington, Vermont

FARMERS in New England, especially in Vermont, boast of their pastures, hay fields, and gardens fertilized with wood ashes. They hoard all that their stoves, furnaces, and maple syrup evaporators produce; sometimes haul them many miles; brave the the dirty task of cleaning hot factory chimneys; or pay a considerable price to get them, because they have found them valuable as a fertilizer. Moreover, they are well aware that the ashes must be kept under cover away from rain so that their soluble plant food may not be lost by leaching. A liberal application, one or two tons per acre, often changes a pasture from a mass of brown moss, ferns, and weeds into a carpet of volunteer white clover. Such changes of vegetation are often phenomenal and often make one think that the ashes directly killed the moss, ferns, and weeds; but it is more likely that desirable plants crowd out the weeds as soon as soil conditions become favorable. While corn, grasses, and other plants are stimulated by wood ashes, alfalfa and clovers in general give the greatest response.

The Romans long ago used wood ashes for fertilizer although they probably were not the first to use them. Campfire residues must always have left a record behind them in the increased growth of surrounding vegetation, which at one time was erroneously attributed to the burning of the soil. De Saussure proved that ashes from the burned plants were responsible for this increased growth and that the minerals in the plants were obtained from the soil. Liebig, a German chemist, after observing the growth of clover, held that ashes contained all of the elements needed by plants; but Lawes and Gilbert showed that nitrogen was also essential.

In the days of early American

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agriculture the burning of timber, brush, and stumps previous to plowing provided a generous supply of ashes containing much needed mineral fertilizer. However, when the plant food had been carried away in crops or in drainage water, some soils became non-productive and were then abandoned. In New England a generation or two ago, ashes were so highly esteemed that considerable quantities were imported from Canada when native supplies failed. When German potash salt deposits were developed and potash was sold at relatively low prices, it replaced ashes as a source for this plant food.

Wood ashes contain considerable plant food, especially potash. In fact, the word "potash" is derived from the term "pot ashes" which were obtained by leaching wood ashes with water and evaporating the soluble portion to dryness. Unleached hardwood ashes contain from 2.5 to 12% potash (K_2O) averaging about 6%, from 1.5 to 2% phosphoric acid (P_2O_5), and from 50 to 75% carbonates of lime and minor elements necessary for adequate plant growth. Their soil acidity corrective value approximates 70 to 100% that of limestone. Thus an average ton of unleached hardwood ashes is considered approximately equivalent to 150 pounds of 20% superphosphate, 240 pounds of 50% muriate of potash, and 1,500 pounds of ground limestone. Softwood ashes contain much less plant food, leached ashes still less (under 2% potash), and coal ashes practically none. It is said that Canadian wood ashes carry a lower potash content than formerly, perhaps due to depletion of minerals in forest soils. In spite of the other fertilizing constituents in wood ashes, they are usually bought and sold on their potash content.

Field Trial Conducted

A number of years ago a field trial was conducted on the Windsor Lime Demonstration Farm at Weathersfield, Vermont (Connecticut River terrace). While its object was to determine the kind and amount of lime that could be most successfully used, the data are of interest now because wood ashes were used at two rates. The field was carefully prepared and well fertilized with 10 tons of manure and 400 pounds of 0-20-20 fertilizer. After the lime or wood ashes were applied, they were well harrowed into the soil. In spite of reasonably good care, a poor stand of alfalfa was secured except on the wood-ash plots. The second year an additional 200 pounds of 0-20-20 fertilizer were applied and the field reseeded. No yield data were obtained that year, but the results the following two years are shown in Table 1.

Table 1—Effect of Wood Ashes vs. Lime on Yield and Longevity of Alfalfa

Treatment	Hay yields per acre on Merrimac s. loam		Alfalfa present
	2nd yr.	3rd yr.	3rd yr.
	lb.	lb.	%
Wood ashes—1 ton	6,900	4,176	95
Hydrated lime—1 ton	4,666	2,559	65
Wood ashes—4 tons	9,980	4,158	96
Hydrated lime—4 tons	4,990	3,345	25

These results show that wood ashes were very much superior to hydrated lime for the production and longevity of alfalfa, at both the 1- and 4-ton rates. On the wood-ash plots, alfalfa remained for many more years in a good vigorous condition; but without ashes, most of it disappeared after the third year and the few remaining plants showed nutritional disorders, the nature of which was not then recognized. Very similar results were obtained on a Sheldon soil at Colchester, Vermont, from a like experiment conducted at the same time. Here, however, the alfalfa died completely after the second year on all but the wood-ash plots. No better results were obtained where limestone was used in place of hydrated lime, indicating that the form of lime was not an important factor.

Since potash is considered to be the most important constituent of wood ashes and since this potash is in the form of silicate and carbonate rather than chloride or sulfate, it was thought that the type of potash might be a factor in its availability and assimilation by the plant. Different forms of potash (chloride, carbonate, and silicate) were substituted in tank experiments for the potash contained in wood ashes. An amount of lime and superphosphate equal to that in the ashes was used with the individual potash salts. The average yields of alfalfa for two years are shown in Table 2.

Wood ashes again proved superior to a chemical equivalent of potash, lime, and superphosphate. Since the different forms of potash did not account for this superiority, it seemed evident that there was some other contributing factor such as beneficial minor elements. Potassium silicate seemed to be better than the other potash forms, probably because it contains more boron which has been found characteristic of calcium and some other silicates.

Table 2—Effect of Different Forms of Potash Salts vs. Wood Ashes on Growth of Alfalfa on Merrimac Sandy Loam

Treatment	Average yield per tank
	gm.
Untreated Check	53
Potassium chloride-lime-phosphate (eq. to 2 tons of ashes)	127
Potassium carbonate - lime - phosphate (eq. to 2 tons of ashes)	143
Potassium silicate-lime-phosphate (eq. to 2 tons of ashes)	163
Wood ashes—2 tons	177
Potassium chloride-lime-phosphate (eq. to 4 tons of ashes)	276
Wood ashes—4 tons	425

Table 3—Borax in Wood Ashes

Origin	Borax per ton*
	lb.
Ontario, Canada	10.0
Ontario, Canada	14.3
Stowe	15.0
White River Junction	15.7
Franklin	15.7
White River Junction	15.7
Newport	17.9
White River Junction	17.9
White River Junction	19.4
Canaan	20.1
Newport	20.8
Guildhall	22.2
Beecher Falls	25.8
Guildhall	25.8
Randolph	26.5
Guildhall	29.1

*All samples were dry and unleached

Within recent years the symptoms of boron deficiency on alfalfa have been recognized and found in marked degree on heavily limed soils. These were especially noticeable in 1940 on the second crop. Because wood ashes overcame these deficiency symptoms, it was assumed that they contained appreciable amounts of boron. This has since been verified by an analysis of 14 samples of wood ashes sent in by county agents. The amount of boron (as borax) per ton of wood ashes, according to the Berger-Truog colorimetric method, is presented in Table 3.

These results show that Vermont hardwood ashes contain a surprisingly high equivalent of borax—averaging about 20 pounds per ton. The figures may perhaps be a little high because of extra dryness of samples (they had been stored in the laboratory for some time), yet the results give a good idea of the amount of boron in wood ashes.

The superiority of wood ashes over equivalent amounts of lime, superphosphate, and potash is held to be due in the main to their boron content. Several field and laboratory trials, the results of which are shown in Table 4, bear out this contention. Replicated field plots of alfalfa were established on a Colton sandy soil to which lime, superphosphate, potash, and boron were applied in order to make, as it were, synthetic wood ashes. Commercial Canadian hardwood ashes, sown at 2- and 4-ton rates, were compared with their chemical fertilizer equivalents of hydrated lime, 20% superphos-

phate, muriate and sulphate of potash (half and half), with and without borax (20 and 40 pounds per acre). The yields of alfalfa, measured in 1939 and 1940, are shown in Table 4.

Borax Increased Yield

The results show that without borax on this soil ordinary mineral fertilizers were ineffective for the production of alfalfa. In conjunction with borax, however, alfalfa yields doubled with practically all cuttings. Chemical fertilizer with borax was even superior to wood ashes. This is at present unexplainable unless it is due to a higher availability of the applied elements in the fertilizer. When 40 pounds of borax per acre were applied, the yield was much superior to that secured when less was used. With borax healthy stands were grown, of which any farmer would be proud, and they still remain dense and green. Furthermore, the borate-fertilized second crop, which was allowed to go to seed in 1940, produced more than 35 times as much seed as the unborated. This appears to be an outstanding, even though preliminary, finding.

Most discouraging results were secured when borax was omitted from the fertilizer. The terminal leaves of the alfalfa plants were yellow and bronze colored, especially in dry weather; the plants blossomed defectively, failed to set seed, and even grew more sparse. These results are leading to further field trials in co-operation with farmers who wish to grow alfalfa seed but who have had innumerable failures.

Four more alfalfa field plots were established in the spring of 1940 to test borated and non-borated fertilizers (borax at 30 pounds per acre). Counts already indicate legumes to be one-third more dense where borax was added to the fertilizers. One of the plots is located on a clay soil where such favorable responses were not expected.

Boron is therefore an important crop-producing constituent of synthetic wood ashes, being in terms of alfalfa growth almost as essential as lime, phosphate, and potash. Its absence explains the failures from the use of these other three essentials. On this crop, which is recognized to have a high boron requirement, the need for borax in Vermont appears to be growing more acute. If it is not used, the stands will fail. In fact, its lack explains why many stands have failed shortly after seeding and why others have failed where once good stands existed. In supplying the abundance of lime which alfalfa requires, farmers unwittingly have induced and aggravated a serious boron deficiency on soils already low in boron, which then spells doom for all legumes they sow.

Boron is known to be essential in Vermont apple orchards and may also be essential in the field for other lime-loving plants, such as red clover, field and garden beans, tomatoes, lettuce, beets, cabbage, and spinach. Borax may be effectively spread on the surface of the soil in granular form; but since there is much danger of burning the foliage if too heavy applications are made, farmers should consult their county agents before attempting to use it. The writers suggest that chemical fertilizers made for use in Vermont, northeastern New York State, and probably other New England States, be enriched with small amounts of borax. Perhaps a borated superphosphate would answer this need as it does in some foreign countries.

Table 4 — The Effect of Hardwood Ashes, and Their Chemical Fertilizer Equivalent With and Without Borax on Yields of Alfalfa

Treatment (per acre rate)	Yield per acre (dry wt.) 1939 1st cut	1939 2nd cut	1940 1st cut	1940 2nd cut
	lb.	lb.	lb.	lb.
Wood ashes—2 tons*	1,500	1,100	2,900	900
Fertilizer equivalent to 2 tons of ashes	1,300	500	1,700	400
Fertilizer equivalent and 20 lb. borax	2,400	1,400	3,500	1,300
Wood ashes—4 tons	2,600	1,600	3,600	1,400
Fertilizer equivalent to 4 tons of ashes	3,200	1,100	2,800	700
Fertilizer equivalent and 40 lb. borax	4,600	1,800	3,900	2,500

*The commercial Canadian hardwood ashes used contained 1.5% P_2O_5, 6% K_2O, 89% calcium carbonate equivalent, and 10 pounds per ton borax equivalent.

Phenothiazine as An Anthelmintic

Condensed from Hog Breeder

Dr. W. E. Gordon

E. I. du Pont de Nemours & Co.

AN anthelmintic may be defined as a medicine or drug which can be effectively used for removing internal parasites from animals. There are a number of products available for this purpose, copper sulphate or blue stone, nicotine sulfate, carbon tetrachloride, tetrachlorethylene, Santonine, oil of chenopodium, oil of wormseed, and several others. All of these materials have very definite anthelmintic action and several of them have found rather widespread commercial use. It is important to point out, however, that most of these materials are subject to rather severe limitations, particularly as to the type of internal parasites which they will effectively remove from animals. For the most part, each of these drugs is effective only on a single type of parasite and will have little or no action on many other types of parasites which commonly infest livestock. As a specific example, we may mention the fact that copper sulfate solutions or solutions containing mixtures of copper sulfate and nicotine sulfate have been rather widely used in recent years for anthelmintic treatment of sheep. These treatments have been of value for the control of the common sheep stomach worm, but of limited value for the control of numerous other common sheep parasites such as bankrupt worms, hookworms, nodular worms, large-mouthed bowel worms and others. Similarly, nicotine sulfate is very useful for removing roundworms from poultry, but has no effect on the cecal worms which are also very prevalent in poultry. While it is possible to effectively control most of these various parasites through the administration of several of the more commonly known anthelmintics, it is not at all practical to diagnose the specific treatment needed for an individual animal nor to give several different kinds of drugs at intervals. It is obvious that a single treatment which would effectively control all of the common parasites, or some of the particular types which have not previously been susceptible of treatment would be highly desirable.

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For the past several years, the United States Department of Agriculture and the Du Pont Company have been carrying on a broad investigational program on phenothiazine. Phenothiazine is a synthetic organic chemical prepared from diphenylamine and sulphur. More recently, the Bureau of Animal Industry of the United States Department of Agriculture conducted a series of experiments to investigate the value of this chemical as an anthelmintic treatment for sheep and swine. Some very promising preliminary results were obtained which led to a broader investigational program and have now very definitely established the value of this drug in the anthelmintic field. The work of the Bureau of Animal Industry on sheep has subsequently been corroborated by investigators in both Canada and Australia, as well as by private investigators in this country.

It may be of interest to describe in some detail the method used in establishing the efficacy of this new drug. The standard method consists of administering the prescribed dose of phenothiazine to an infested animal, followed by collection of the feces for several days and examination to determine the number and kinds of parasites which are removed by the specific dosage used. After several days, the animal is slaughtered and the gastro-intestinal tract is examined to determine the number and kind of parasites which remain in the animal. From the data secured, it is a simple matter to determine the efficiency of the drug in removing any of the various kinds of parasites present in the infested animal. By a procedure such as the above, conducted on a large number of animals, the Bureau of Animal Industry found that phenothiazine was extremely effective for the removal of several different species of parasites from the digestive tracts of sheep. The drug was particularly effective in removing the common stomach worm, the lesser stomach worm, bankrupt worm, hook worm, large-mouthed bowel worm and the nodular worm. Phenothiazine was also found to be somewhat effective for the removal of threadnecked strongyles and whip worms, but was wholly ineffective for the removal of tape worms. It is thus apparent that a single treatment with phenothiazine, in contrast with other anthelmintic treatments, will remove nearly all of the common parasites infesting sheep. We feel that this characteristic of phenothiazine, namely its high efficiency against several different types of parasites, is extremely important and represents a real forward advance in anthelmintic treatment.

Following up the initial work on sheep, experiments have been

conducted with phenothiazine in the treatment of many other animals including swine, horses, mules, goats, cattle and poultry. In all cases, phenothiazine has shown a high efficiency in controlling many of the common parasites infesting these animals and has been found non-toxic and completely safe to use in therapeutic doses.

In the treatment of swine, phenothiazine has been found as effective as oil of chenopodium in removing ascarids and is the only satisfactory treatment known which is effective for the removal of nodular worms from swine. Phenothiazine has many advantages over other anthelmintics for this purpose since it has very low toxicity and is more efficient in heavily infested than in lightly infested animals. Furthermore, it is effective against more than one species of parasite and it is unnecessary to fast the animal prior to treatment. While a great deal of investigational work on swine treatment is still in progress, the following dosage has been recommended by the Bureau of Animal Industry for experimental use:

8 grams for animals weighing 25 to 50 lbs.
12 grams for animals weighing 50 to 100 lbs.
20 grams for animals weighing 100 to 200 lbs.
30 grams for animals weighing 200 lbs. or more

There is now some evidence to indicate that somewhat larger dosages may be necessary for the effective treatment of swine, but even the larger doses are completely free from any toxic effect.

The early investigational work was conducted almost entirely with powdered phenothiazine in admixture with various feeds. While the drug is essentially odorless, tasteless, it was found in this early work that many animals would refuse to eat feed mixtures containing phenothiazine or did not consume a sufficient amount to obtain a therapeutic dose. It is entirely possible that these objections may be overcome through the preparation of more palatable mixtures which will lend themselves to administration to several animals at a time by trough feeding.

Some investigators prefer the use of compressed tablets or boluses which may or may not be enclosed in a gelatine capsule. Phenothiazine in powder form is rather bulky and even when compressed and put in capsule form, the size of the dose necessitates the use of two or more capsules. A Canadian investigator, Dr. W. E. Swales, of MacDonald College, recommends the use of a mixture of phenothiazine with phenolphthalein, effervescent salts, starch and dried ox gall, this mixture being compressed into bolus form for ready administration. The purpose of the add-

ed ingredients is to secure rapid disintegration of the bolus in the animal's stomach and to provide a slight laxative action.

More recently, several commercial concerns have prepared phenothiazine in suspension form for administration as a drench. Suspensions of this kind are easily administered with the ordinary dosing syringes and have given very effective results.

With regard to the distribution of phenothiazine, we would point out that the anthelmintic use of the drug is only a very recent development and the availability of commercial preparations through the usual sources of supply is just getting started. At the present time the drug is for the most part being distributed by veterinary supply houses to veterinarians and by some stock remedy concerns direct to consumers.

We would like to stress the point that much investigational work on the anthelmintic use of phenothiazine is now in progress and very likely a great deal more will be required before this product finds maximum consumer acceptance. However, the data now available give us every reason to believe that this new drug will eventually be recognized as the outstanding anthelmintic treatment for animals.

A pipe factory at Boone, North Carolina, is running two shifts to fill orders for pipe blocks made from ivy, laurel and rhododendron burls, since the war halted shipments of briarwood from Italy, France and Algiers. Local citizens say there is also an unlimited supply of native briarwood, which is of the same family as the white heath plant of southern Europe. Only that portion of plant growing just beneath the soil is used for pipes.

—*Farm Journal*

Making Veal from Dairy Calves

Condensed from Pacific Rural Press

THERE has been considerable interest lately in raising dairy calves for veal. A good many people besides dairymen have been interested in trying to raise calves secured from dairies for veal, but in most cases these people propose to use calf meals or other milk substitutes. These substitutes may be all right to use in raising a heifer calf for a dairy cow, but the best veal can only be raised on whole milk.

As a rule, the market prefers a veal calf that weighs from 140 to 155 pounds. Veal calves are generally classified as follows:

Light weights	110 lbs or less
Medium weight	110 lbs. to 160 lbs.
Heavy weight	180 lbs. and over

It is reported in some markets that most dairy veal is underweight and not finished when sold. Dark-colored meat indicates that the calf is too old. The carcasses of the best veal calves are characterized by flesh of light color and fine grain. The most important factors contributing to the value of a veal calf are condition and weight for age.

An important factor to be taken into consideration as to whether or not a calf may be profitably fed for veal is the birth weight. If 150 pounds is the best weight for a veal calf, then it is clear that a calf large at birth will make the 150-pound weight at much less cost than the calf small at birth. The amount of whole milk necessary to produce a pound of veal will vary considerably, but generally will be between eight and twelve pounds. On the average, one can figure ten pounds of whole milk will produce a pound of veal.

Professor Mead of the University of California, at Davis, has prepared the following table which is useful in figuring whether it pays to raise veal calves.

In preparing this table, Professor Mead made the following assumptions:

(1) Ten pounds of whole milk to make a pound of veal
(2) Milk valued at $1.50 per cwt. or about 13c a gallon
(3) Calf to be sold at 150 pounds
(4) Veal worth 11c pound

The profit indicated at these figures would change with a different veal price and with a different cost of milk. Also, a skillful feeder might be able to make

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a pound of veal with less than 10 pounds of milk. With calves that had scoured, however, it would probably take more than 10 pounds of milk to make a pound of veal.

With hand-fed calves, it is best to feed the calf lightly for a few days, probably not feeding much more than two quarts at a feeding. The amount of milk should then be gradually increased until the calf is getting from three to four quarts of milk at a feed. A calf will eat a small amount of grain after it is three or four weeks of age, and after it is a month old it will take a small amount of alfalfa hay.

Scours is the worst enemy of the veal calf, and after a bad case of scours the calf is generally not able to take a full feed of milk for some time. Such a calf may also lose flesh and by the time it is in good condition again it may be too heavy to be first-class veal.

Birth Weight of Calf	Pounds of Milk Fed lbs.	Cost of Milk	Value of Veal Calf	Profit
50 lbs.	1,000	$15.00	$16.50	$1.50
60 lbs.	900	13.50	16.50	3.00
70 lbs.	800	12.00	16.50	4.50
80 lbs.	700	10.50	16.50	6.00
90 lbs.	600	9.00	16.50	7.50
100 lbs.	500	7.50	16.50	9.00

Analyze Your Costs

Condensed from New England Homestead

Frank D. Reed

THE production of hatching eggs here in New England, particularly for the large hatcheries in or near the Del-Mar-Va broiler area, is in its hey-day. In Maine, at least one-half of our commercial poultry raisers are in this specialized business. For 10 years the output of New England hatching eggs and baby chicks has increased by leaps and bounds. A measure of the size of this enterprise is revealed by the official figures on breeding birds tested for pullorum infection. In Maine, last season, there were 356,000 birds tested—20% of the hen population of the state; in Massachusetts 573,000 birds—19% of the total hen population; Connecticut, 336,000 — 14%; and New Hampshire, 782,000—61% of all the birds in the state! Remember, nearly every one of these birds was tested because the owner expected to sell hatching eggs.

As a natural result of increased efficiency of production, and because more and more people have jumped into this specialized phase of poultry keeping, there has come a lowering of the "premiums" paid for hatching eggs. These premiums of 10c, 15c, and 20c per dozen above market eggs look very attractive. But how many have actually attempted to figure out how much *extra* it costs to produce hatching eggs over market eggs? The purpose of this article is not to register the complaint that hatching egg premiums are too low or to build up a case for higher premiums. Let us avoid wishful thinking about the possibilities of higher premiums, for there must be retained a proper relationship with market egg prices, otherwise, we attract too many table egg producers into the hatching egg game. The purpose of this article is solely to urge every poultryman to sit down with a pencil and paper and indulge in a little very profitable mental exercise in figuring out whether or not he is making or losing money on his hatching eggs. Many producers have found a considerable extra income through hatching egg production. Unquestionably, however, many others are actually and unwittingly losing money on their venture. Every producer of hatching eggs has the alternative

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of going back to the production of market eggs exclusively, and our analysis of costs should start with market egg prices as a base.

This problem of figuring costs will be much simplified if we approach it from the angle of "extra" costs over what we would have if we produced table eggs only. My estimates in the table below include only those costs which we can measure directly. But the poultryman must consider several other factors as well. What is the "cost" of the extra "wear and tear" on the hens when they are mated up? How many less eggs do we get? How much more mortality? How much less is the meat value of breeders after we get through with them? How much extra labor is involved?

The estimates in the table below are my own. They will not necessarily apply to other individuals, but to the best of my knowledge they represent average costs here in Maine. One very important item of cost which many poultrymen overlook is the approximate 7% reduction in housing capacity occasioned by the presence of male birds in the pens. This results automatically in a 7% increase in overhead (interest and depreciation) and labor chargeable to hatching eggs. Another way to look at this would be that we lose the profit from 70 hens—for we could just as well have 70 extra hens as 70 cockerels. Either way, it figures out nearly the same. These estimates are on the basis of the 1000 bird flock mated up the year round.

Extra Costs of Producing Hatching Eggs Per 1,000 Birds*

1. Pullorum testing at 4c	$ 40.00
2. Depreciation males — 140 birds (2 sets) at $1	140.00
3. Feed males in breeding pens (70 birds at 2 lbs. feed per week)	140.00
4. Extra cost of breeder ration at 15c per cwt. (50 lbs. mash per breeder)	75.00
5. Share in interest on investment 7% of $360 total interest charge	25.00
6. Share in depreciation on buildings and equipment 7% of $285 total depreciation	20.00
7. Share in labor costs 7% of 2,000 hours at 30c	60.00
Total	$500.00

*These costs are measurable costs only—they do not include "wear and tear" on breeders resulting in lower egg production, lower meat value, and more culls and mortality.

Once we obtain a figure for total costs we have a basis for figuring cost per dozen hatching eggs. By dividing the number of hatching eggs we have sold or expect to sell into this total we can obtain our cost per dozen. This figure when compared to the extra money received over market egg price (the "premium") will tell us whether the hatching egg venture has been a profit or loss. Obviously, the more hatching eggs we sell per breeder, or the longer we ship, the lower is our

cost per dozen. From this it is evident that the "premium" per dozen eggs is, itself, not more important than the length of the shipping season and the number of eggs sold.

The table below shows the number of hatching eggs which must be sold to meet the costs involved at various premiums. The table also shows the length of shipping period which would be required to produce this number of eggs. This assumes a production of saleable hatching eggs of 40% (60% actual production) and assumes further that all eggs salable as hatching eggs are so sold. "Premium" means price over what the eggs would bring on the farm as market eggs. Thus a payment of 10 cents over top Boston, express paid by the hatchery, and some 22 oz. eggs accepted, might actually mean to the Maine wholesale producer a 15 cent premium.

1,000 Bird Flock

Premium	Sales Necessary To Meet Costs	Length of Shipping Period
10c	5,000 dozen	23 weeks
15c	3,333 dozen	15 weeks
20c	2,500 dozen	11½ weeks

Hatching egg producers, study your costs carefully. While a 10c or 15c premium may look attractive, have you any assurance that you can sell hatching eggs, except in the "short" season or for more than a few months? Perhaps you will find that hatching egg production is returning you a tidy extra income, or possibly you will find that you would be better off selling only table eggs. At any rate. you ought to know.

Vitamins on a Bee's Knees

Condensed from Farm Journal and Farmer's Wife

IT'S plain, old fashioned bee pollen, but it may be a new scientific glamour girl." Hambleton held the tube of pellets up against the light . . . . baby beads of coral, amber, jet, "We estimate," he said, "that by rationing bee diets and adding soybean meal, apiarists can collect 100,000 tons of pollen pellets a year from American hives.

"The potentialities of the stuff seem to be tremendous. Analysis shows that the pollen pellets are 22 to 30% protein (twice that of average alfalfa leaf meal) and so rich in other food values that young bees increase 1500 to 2500 times in weight in five and a half days. If those same values can be transferred to industrial use or human nutrition. . . ." He shrugged. "Concentrated protein and vitamins are worth money. Where and how to use and sell? That's what we're trying to find out."

James I. Hambleton is principal apiculturist of the Bureau of Entomology and Plant Quarantine in the laurel studded hills of the Federal experimental farms at Beltsville, Md. The discovery of the tons of possible vitamins on the bee's knees is the result of feeding experiments conducted by his bureau in California, Wisconsin, Wyoming and at Beltsville. Immediate cause is a strange little trap developed by Federal bee men. Indirect cause is the honey surplus created by Germany and the depression a decade ago.

The trap is a minute machine rigged up at the door of the beehive. It flicks off the two pellets the worker bee brings back to his ware house after a hard morning's work of cross-pollenizing flowers. It takes 170,000,000 flower visits to accumulate the 50 pints of pollen that a normal swarm of young bees will devour during babyhood.

Hambleton and his apiculturists stepped into the field during the early '30s. Germany, once a 12,000,000 lb. a year customer for U. S. honey, clamped down an embargo in the late 1920's. Then the depression sent prices skittering. The Federal beemen, ordered to develop low cost production methods, soon discovered that although grown bees can pull through the winter and spring with sugar syrup, young bees won't grow without pollen.

Hambleton and his men found that soybean flour has some of the potent characteristics of pol-

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len. They began mixing it with pollen feed; young bees grew fast.

"If the pollen, under experimentation, shows signs of becoming a valuable product in the manufacturing or foods industries," Hambleton explained, "it can be collected through use of the traps. We've pretty well worked out a diet for the young bees. Sufficient supplies of the natural food can be held in reserve to mix with soy flour, and build swarms up for summer production. The surplus will be available to industry."

Artificial feeding will also open new avenues in honey production, he believes. Colonies of bees fed with the pollen-soy bean mix during experiments at Laramie, Wyo., each produced 50 lbs. of dandelion honey . . . a rarity in the industry.

Pollen's story is still unfolding in the laboratory experiments being conducted at Madison, Wis., by C. L. Farrar and at Davis, Calif., by F. E. Todd. "Only persistent research will give the answers," Hambleton sighed.

"Got lost in the dandelion bush" may be an alibi for playing hookey from school in 1950. Farmers in Los Angeles County, Cal., began to domesticate the plant a few seasons ago; this year are shipping out, as greens, celery-like stalks that are 12 to 18 inches high.

—*Farm Journal*

Another Simple Mow Hay Drier

Condensed from Electricity on the Farm

P. D. Rodgers

Virginia Polytechnic Institute

ONE winter night last year a group of farmers, their county agent and vocational teacher got together in southwest Virginia. Men from the power company and the State College were there. The man from the college told them about the hay driers installed in barns in the Tennessee Valley.

R. G. Stevens, a farmer near Dublin, Virginia, went to work right after the meeting. He built a hay drier in his own barn, using the duct system recommended, but adding a hot water heating plant for additional insurance against bad weather.

The drier consists of a main air duct down the center of the mow floor with lateral ducts at regular intervals. These laterals have a one-inch slot along each side near the floor so that air will pass out through the hay. Air is forced through the ducts and hay by a blower located at the side of the barn. A 5 hp motor operates the blower which has a capacity of 12,000 cubic feet of air each minute. Hot water radiators were placed in the delivery duct where all the air from the blower passes through them on its way to the hay. A residential hot water boiler with coal stoker supplies the heat.

Last summer this drier made 70 tons of excellent alfalfa hay, in spite of very rainy weather. It rained an average of once every three days all summer. Mr. Stevens made hay just the same. It cured so well that it sold for $5.00 a ton extra. Counting all his costs for power, coal, labor, depreciation, and interest on investment, Mr. Stevens still had a balance of more than $2.00 per ton, or a profit of $140 for the first year. But that isn't all. Without his drier last season, he wouldn't have had 70 tons of hay to sell. Much of it would have been lost or so badly weathered that it would have had no market value.

Mr. Stevens likes his drier so well he is making plans now to grow four times as much alfalfa and expand the equipment to take care of it.

A drier of this type permits cutting hay in the morning, al-

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lowing it to dry in the sun from two to four hours and then be put into the barn. The sun doesn't bleach it. There is very little chance of getting rained on. Leaves don't shatter when it is pitched on the wagon. During favorable weather the two to four hours sun drying will bring the moisture content of the hay from 75 per cent down to 45 per cent and the drier need remove only about 25 per cent for safe storage without danger of spoilage.

Driers without heaters are producing good hay. When conditions are unfavorable, however, it is possible to put hay in the barn in wetter condition if the drier has auxiliary heating equipment. The cost of coal and electricity was about $1.00 per ton when the hay was dried from an original moisture content of 50%.

Both with hogs on alfalfa pasture and in dry lot, mixtures of protein supplements were more efficient than a single protein supplement in hog rations, it was found by C. M. Vestal in a series of experiments conducted at the Purdue Agricultural Experiment Station, LaFayette, Indiana.

In the dry lot experiment, a mixture of 20 parts meat and bone scraps, 20 parts menhaden fish meal, 30 parts soybean oil meal, 10 parts linseed oil meal, 10 parts cottonseed meal, and 10 parts alfalfa leaf meal proved especially effective. On pasture a similar mixture with the alfalfa leaf meal replaced by an additional 10 parts of soybean oil meal. gave best results of the supplements studied.

These mixed supplements were compared with a standard supplement of meat and bone scraps for purposes of the experiments.

—*Duroc News*

Forty Million Broilers

L. E. Weaver

Condensed from American Agriculturist

AN amazing thing has been happening in the poultry world. Poultrykeepers in the Delmarva area have largely changed over from the production of market eggs to the production of broilers. They seem to have struck a gold mine, and now all their neighbors have joined the broiler procession, and every one is feverishly enlarging his operations. To an outsider it has all the earmarks of uncontrolled inflation. I came away from a two days visit asking myself, "how soon will the bubble burst?"

Broiler growing in the Delmarva area is not a new thing. Only the rapid and extensive expansion is recent and "newsworthy." In 1925, according to the best information I could get, the new industry for this section was born. In that year Mr. Irwin Steel grew the first broilers in Selbyville, Delaware, only a few miles from the Maryland line.

It may be well to explain at this point that the name "Delmarva" now so commonly used to denote the peninsula on the eastern shore of Chesapeake Bay, is derived by adding the D-E-L of Delaware to the M-A-R of Maryland and the V-A of Virginia. The broiler section includes the southernmost county of Delaware, the Maryland counties to the west and south, and two Virginia counties that are entirely separated from the rest of the state.

Leaving New York City I drove to Philadelphia, then through Wilmington to Newark in the northern end of Delaware. Here I stopped at the State College and sought out the office of my genial and hospitable friend Professor H. L. Richardson, extension poultryman for Delaware. His secretary informed me that Professor Richardson was down in the broiler section, so on I went. At Georgetown I found the Assistant County Agent of Sussex County, Mr. Frank Gordy, and he located Professor Richardson.

My education in broiler-growing as an industry within the poultry industry began at once. On the wall of the County Agent's office is a chart showing the sources of the county's agricultural income. Broilers alone account for 53 per cent, far more important than any other enter-

Reprinted by permission from the American Agriculturist, Ithaca, N. Y., May 10, 1941

prise. Poultry, aside from broilers, is next in size, adding enough that poultry plus broilers furnish more than 65 per cent of the total agricultural income. Driving around the country one would say that apples and other fruits are important crops, also vegetable growing, but on the chart they are insignificant in comparison with broilers. The year-around production of cross-bred chicks to be grown into broilers is the chief industry next to the actual growing of broilers.

Rapid Expansion

I was told of 50 carloads of coal stove brooders sold in the area since last July. Each car holds 250 stoves. Each stove broods 500 chicks at a time. The usual age at which broilers are sold is 14 weeks and that means three lots per year for each stove. Now you could figure for yourself what the increase has been since last July, except for the fact that there were other stoves sold and I couldn't find out how many. "Ten carloads maybe, or perhaps more," I was told.

As I rode around the country, with Professor Richardson in the capacity of guide, I saw dozens of new houses, particularly on the back roads. These are not mere hundred foot affairs. Many were several hundred feet in length. They can build them that way because the country is so level. They are extremely simple in design and construction. Shed roofs mostly, and about 18 feet from front to back, built as a rule of unplaned lumber. Shingles are being put on the newer houses because such houses are not quite so hot in summer.

Professor Richardson told me that neither the flat "built-up" roof nor roofs insulated by filling shavings between rafters in a ceiled house have proven satisfactory. The built-up roof is very hot; the other is apt to leak and you can't find the holes. Foundations are of cinder blocks or concrete, and usually the local sandy soil serves as the only floor. Most of the lumber is sawed from the native loblolly pine by portable sawmills. Coarse sawdust is the popular litter material in the broiler pens. All of this makes for low investment costs. If the bubble does burst, and these new houses have to stand idle, the loss won't be the same as though these were multi-deck insulated houses.

One fact is startlingly clear. Batteries are not used here for large scale broiler production. One reason, they tell me, is that the cost of building a house is no greater than the cost of a battery to hold the same number of birds, and there would still have to be a house for the battery. Another reason is the belief that battery broilers cannot be grown to weights of 4 pounds or more, as many of these are, and be

equal to floor grown birds in quality and appearance.

Five years ago extensive surveys were made of the broiler industry in the Delmarva peninsula. These surveys revealed an average profit of one and one-half cents per broiler; also that nearly half of the growers were making no profit.

Conditions have changed. A study made by Delaware workers in 1939 indicates an average net profit *per pound of broiler sold* of 1.7 cents. Since the average weight at which broilers were sold was 2.94 pounds, the profit per broiler was 5 cents. That was two years ago when the average selling price was 16.2 cents per pound. Since last December broilers have been selling at 17 to 22 cents. Costs of rearing have not gone up to any extent. Obviously even marginal producers have made good money. I was told that returns from 150 to 200 dollars per thousand chicks have been common. Is it any wonder that new houses are going up like mushrooms?

Go Slow!

The mild climate of the Delmarva region permits the use of inexpensive houses, and allows chicks outside throughout the year; also keeps fuel costs low. Land, labor and feed are cheap. Markets are close by and marketing practices standardized. Moreover, because of long experience these growers can take advantage of economies, and keep costs at a minimum. Major savings are achieved through the purchase of chicks and feed in large quantities. The Morris hatchery, which I visited at Bishopville, Maryland, is said to be the largest in the world. They set 400,000 eggs per week and produce 15 million chicks per year. The eggs all come from New England. These producers demand chicks that are free of Pullorum. Also they have no patience with "cheap" chicks. One study has shown that those who paid most for chicks made the most money per broiler. One of the main requirements for success is that chick losses be kept low. Average mortality in the 1939 study was 10 per cent. The farms with highest returns took a 6.71 per cent loss; the "lowest-return" farms lost 13.7%.

Local production of hatching eggs has become an extensive and profitable industry. Apparently local chicks are equal to those from New England, but many people will not believe it.

The marketing of the birds was a surprise to me. I had known that most of the broilers were sold alive to buyers at the farms. I knew, too, that these men trucked the birds to Philadelphia, New York, and other eastern cities. When I learned that there are at least a half-dozen large dressing plants in the region I supposed,

of course, they were packing for storage in times of surplus when the birds were low in price. This is not the case. I visited a dressing plant where twelve hundred are dressed per hour. All are packed in ice in barrels and shipped to cities from New York to Miami for immediate consumption. These are milk-fed before killing.

Buyers for the dressing plants line up with the others at farm auctions to bid on lots that are ready to go. Growers like to sell at three pounds. They will hold for better prices if the market is low, but they seldom hold broilers beyond 14 weeks. Losses and feed costs mount rapidly past that point.

I asked three different growers how they fed their broilers. They followed almost exactly the same plan. Fine cracked corn with or without starting mash for the first few weeks. Mostly mash after that. At two weeks whole clipped oats are started, 25 per cent as much oats as mash. Two weeks before the broilers are to be marketed oats are omitted and corn given—all they will eat. That puts on the deep yellow color that is a prime requirement. Grit in ample supply is given all the way through. There is remarkably little feather picking and cannibalism.

Corn is grown and fed at home on a large scale, but practically all mash is purchased. Twenty-six brands of feed are sold in the territory, I was told. The chicks are usually crowded in about twice as many to a stove as would be safe if they were to be grown for layers. However, the studies show that even here there is a "point of diminishing returns." Smaller flocks show lower mortality, less feed per pound of gain, better average selling price indicating better finish.

Uniformity Through Inbreeding

Condensed from Holstein-Friesian World

J. E. Balmer

NO subject is hedged about with so many superstitions, dogmas, and irrational traditions as the subject of inbreeding. Questions concerning inbreeding are evasively answered or ignored by many breed publications. Those writers who have been inclined to defend the practice have been assailed. Generally the result of a controversy on inbreeding has been the generating of more heat than light on the subject.

The theory of inbreeding is "that uniformity will best be achieved by making the germ cells more uniform." This is done by narrowing the network of descent by mating animals genetically related to one another.

Protoplasm, of which living cells are composed, is so complex and variable that it is not subject to analyses such as are applied to other chemical compositions. If we could take the so-called chromosomes, in the uniting germ cells, apart and discover how they function we might be able to eliminate the undesirable factors that thwart our breeding aspirations. We cannot, so, we have to theoretically determine their actions from evidence obtained in various types of matings.

All types of close breeding whether line-breeding, inbreeding or in-and-in breeding have the same principle. The difference is one of degree. This principle, as stated, is to gather together friendly chromosomes. Consequently all of these terms, so familiar to breeders, are here considered as types of inbreeding.

Inbreeding, supposedly, will better bring about the desired uniformity than outcrossing. One must be careful that rigid selection accompanies his inbreeding practices or the result may prove disastrous.

By outcrossing it is possible to so dilute and dissipate the genes in the germ cells that the chance of securing uniformity is extremely remote. Many breeders believe that it is not a question of how much inbreeding is advisable but rather how much outcrossing is permissible.

Inbreeding, so-called, is often considered as mating two animals with sufficient similarity of ancestry to make 50% of the inheritance of one individual with the

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same proportion in its mate, the inheritance not necessarily being that of one animal. Examples are full brother and sister, half brother and sister, sire and daughter, and son to dam.

Line-breeding is sometimes differentiated from inbreeding by defining it as mating two individuals identical to the extent of 25% and less than 50% of their blood. Some consider anything farther removed than first cousins as line-breeding. Line-breeding is supposed to permit concentration of type by selection from numerous descendants of a good individual and retaining the best features of that individual without concentration of genes that might cause some minor weakness to be intensified into something more serious.

If breeding animals were as simple a procedure as putting two chemical reagents into a test tube, we could merely mate two animals of similar type, say two grand champions, and after a stated time expect the same reaction in each instance. It does not happen that way. You may mate two animals and, as has occurred in a few cases, get an outstanding individual. A second mating under identical circumstances would not have even one that shows outstanding ability. Furthermore, there may be two superior individuals by the same parents in successive matings and neither one will have the ability to transmit his splendid individuality to the next generation. Then, too, one may be prepotent while the other is a decided failure. There is a decided lack of uniformity of the individuals in a given litter of animals such as hogs, dogs, etc.; there is a much greater lack of uniformity in the ability of these animals to perpetuate themselves. Will inbreeding help to bring greater uniformity? There are noted authorities who advocate inbreeding when and if it is used intelligently.

Major David Castleman says, "Inbreeding has produced some of our finest successes and some of the most dismal failures. We use it but feel that in so doing we are playing with fire." Marshall in *Breeding Farm Animals* says, "The value of inbreeding in plants and animals in the past may be summed up with the statement that it is the greatest single agency in bringing about uniformity and concentration of desired qualities." East in *Inbreeding and Outcrossing* says, "Close breeding is the rule and not the exception in notable animals that stand out as having marked eras of special progress among domestic animals."

The most extreme examples of intense inbreeding are shown in the development of Jersey and Guernsey cattle. East says, "These two breeds have been built up by a more conscious, per-

sistent system of inbreeding than is recorded in the history of any living strain of livestock. In fact since 1763 rigidly enforced laws have prevented the landing of any live cattle whatever on either island except for slaughter. When one realizes that the largest of these islands, that of Jersey, is but eleven miles long by six wide, he can appreciate the amount of inbreeding these laws have promoted." Either of these islands could be placed in New York City or Chicago and be lost, yet in their small areas have originated two of the most beautiful ideals of breeding. The skeptic, who doubts this method of securing uniformity needs only to scan the pedigrees of some of these island producers. The famous Jersey bull "Sybils Gamboge" which sold for $65,000 was the result of half brother and sister matings for four generations.

Dr. Helen King, of the University of Pennsylvania, has mated brother and sister white rats consecutively for sixty generations, producing over fifty thousand individuals. By careful selection and the elimination of undesirables she is now able to produce white rats, apparently the exact duplicate of their parents and of each other. The selected germ-to-germ lines or "bloodlines" so-called, have been so concentrated in these individuals that the returns in uniformity have been most gratifying. Anything that was lost by inbreeding was usually something undesirable. "Inbreeding was therefore as a detective seeking out crime by getting rid of abnormalities, monstrosities, and serious weaknesses of all kinds, thus purifying and analyzing the breeding stock."

There are records of flocks of sheep into which no new animals have been introduced for a hundred years. Close breeding and rigid selection have brought a uniformity that is the envy of rival breeders.

The assumption that the progeny, whose parents are related, are more prepotent than those resulting from the union of individuals of entirely dissimilar strains seems to be substantiated by the examples given and the conclusions of some of our genetics authorities.

There must be a definite objective when inbreeding is practiced. Race horses have been inbred for speed and endurance. Shetland ponies have been inbred for dwarfness as have Percheron and Clydesdale horses for size and strength. The person who merely considers inbreeding as mating close relations has a narrow viewpoint on the subject. Defects may be concentrated by inbreeding as well as points of merit. Inbreeding without discrimination and rigid selection will yield more evil results than good. Nature sees to it that racial

beauty and strength are not permitted to deteriorate. There is much inbreeding among animals in the natural state but there is also the selection of the fit and the rejection of the unfit. Here is the cardinal principle of the science of inbreeding. The rule of the survival of the fittest prevails in nature.

Consequently one who practices inbreeding must know what he wants. He must know his breed standard. He must have courage. He must ignore the vast lore of superstition that has been associated with inbreeding. When more breeders possess these qualities the breed will reach heights never dreamed of by its originators.

Good But Unpalatable

Crested wheat grass is well adapted to conditions in northern sections of the Plains states, but when sown for pasture it should be in solid stands fenced so livestock can be confined to it alone. Results at Edgely Experiment Station in LaMoure county, North Dakota, indicate crested wheat grass is so unpalatable cattle will overgraze other grasses before they will touch it. In a pasture with 4 principal varieties of grass, brome was grazed to the ground, quack was clipped almost as short. A wild grass known locally as niggerwool was used as filler after the 2 palatable grasses were gone and crested wheat was permitted to head with only occasional bites taken from scattered spots. Those with experience in grazing the grass note that cattle eat it readily and do well on it when there is no other grass in the field to graze. A palatability trial at Kansas Experiment Station a few years ago showed dairy cows would not eat crested wheat grass so long as brome grass, Kentucky bluegrass, clover and alfalfa were available.

—*Capper's Farmer*

Rust on the Roof

Condensed from The Ohio Farmer

G. R. Shier

Agric. Engineer, Ohio State University

METAL is by far the most common roofing material used on Ohio farm buildings. Houses and barns on the poorest and richest farms vibrate to the drumming of raindrops on the old "tin roof." In the beginning, many were covered with real tinned sheets and occasionally tinned sheets are used today, but the bulk of today's roofs are the zinc coated sheets commonly known as galvanized.

Roofing sheets were galvanized by hand dipping a generation or two ago with the result that the sheets varied considerably in the thickness of the zinc coating. Today the sheets are galvanized automatically by machine. The amount of zinc coating applied can be and is regulated according to the wishes of the manufacturer. This is important because the amount of zinc coating determines to a large extent how soon rust will appear.

Most manufacturers produce several grades of galvanized roofing, and the kind to buy will depend somewhat upon the purpose for which it is to be used. The amount of zinc on the sheets is probably the most important consideration in preventing rust. Ordinary grades of roofing sheets carry about an ounce and a quarter of zinc per square foot. Another grade carrying two ounces of zinc per square foot can be had which will give two or three times longer service than the ordinary grades. In the two ounce grades most manufacturers stamp each sheet with a special "Seal of Quality Label" stating that the sheet bears two ounces of zinc per square foot. The "Seal of Quality" sheets cost slightly more but will avoid the necessity for applying several coats of paint. In fact, it should not be necessary to paint "Seal of Quality" roofing for 20 to 30 years.

Some kinds of roofing steel contain copper. It has been proved that copper reduces the rate at which iron or steel rusts but copper bearing roofing will begin to rust just as soon as the zinc wears off; so there is little advantage in buying the copper

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bearing sheets unless one expects never to apply paint. In the case of roofing it would be better to get the two-ounce "Seal of Quality" sheets, but in the case of wire fencing which is seldom painted, it would be best to get copper bearing steel in addition to a heavy coating of zinc galvanizing.

So much for the fellow who plans to get a new roof but how about the fellow with the old roof that is already rusted? His problem is a good deal harder because he already has the rust, and maybe some poor paint coats in addition.

First, a word of caution about the time to paint. If the roof is painted before any rusting is apparent, then almost any color of a good grade outdoor paint may be used. The only cautions needed are to wait until the roof has weathered for six months or so and to do the painting on bright days. Metal roofs should never be painted unless the roof is warm; otherwise, the metal often has a thin film of moisture on it which may prevent the paint from setting tight to the roof.

If a roof is badly rusted, it is usually best to brush it vigorously with a steel brush to remove loose rust particles before painting. Two coats of paint on pitted spots will greatly prolong the general life of the paint job.

If the roof has begun to rust, it is necessary to use a rust retarding paint. Two coats of a good paint often give more than double the service of a single coat. For the fellow who intends to apply only one coat of paint there are only two generally available paints that can be regarded as satisfactory. One of these is the red iron oxide roof paint which is now in general use. According to my observation about 25 percent of the painted metal roofs are painted red. Most of the others are black or aluminum which are inferior types of paints.

The other satisfactory single coat paint is the metallic zinc dust paint. At its best it contains 80 percent zinc dust and 20 percent zinc oxide mixed with linseed oil, or a mixture of linseed and soybean oil may be used. It costs more than the red iron oxide paint, but spreads farther per gallon and lasts much longer. It has the further advantage that it can be tinted red with iron oxide without losing its durability. It can also be tinted green, but will lose some durability, altho it will still be far more durable than any other single coat of green paint. The metallic zinc paint has a natural gray color very similar to unrusted galvanized sheets. A good metallic zinc paint should weigh about 23 pounds per gallon. Roofs are frequently seen where several sheets show rust at an early date while the bulk of the roof remains unrusted. Metallic

zinc paint will work a miracle on such a roof, as it is possible to paint the rusted sheets and make them so nearly like the unrusted sheets that no one will notice the difference.

Oftentimes bundles of roofing sheets are left out in the open for a few days before they are applied. When the bundle is opened, some of the sheets will be found to have a white deposit on them. This is due to chemical action when the sheets are wet in the absence of air. Sheets damaged in this manner should never be purchased as they will rust very quickly. Bundles of roofing sheets should be kept dry, or if left in the open, they should be separated so that air can circulate between them. A heavy coating of zinc will not prevent rust if the sheets are damaged by bad storage or handling.

Aluminum paint has come into general use in the past few years and has been used on about 20 percent of the painted metal roofs. It has one real advantage in that it reflects much of the light which falls on the roof and so makes the under side of the roof cooler. However, it is not a rust resistant paint and should never be applied to rusty iron. It should always be applied as a second or third coat over a rust resistant paint such as metallic zinc dust as it will last for several years even tho the aluminum be worn away.

Blue lead is also used and either it or red lead are satisfactory rust-resistant paints for use under aluminum. Neither blue nor red lead are satisfactory alone as they chalk rapidly and soon wash away. Furthermore, all lead paints are poisonous to animals and not suitable on roofs that drain into cisterns.

About half of the painted metal roofs seem to have been covered with some type of black paint. Black paints applied directly to iron do not seem to retard rust. In fact, some of them apparently hasten it.

These seems little advantage in using black paint when such good paints as iron oxide and metallic zinc can be had which give more protection per dollar and in the case of iron oxide cost little or no more per gallon than many of the black paints used.

If the roof is already painted black or aluminum, it is useless to apply metallic zinc paint over the old paint, but it can be applied over old iron oxide paint if the loose paint and rust is first brushed off. Old black or aluminum paint should be allowed to weather off or be removed by burning or with paint remover before applying a good rust-resistant paint.

What Price Breeding?

Condensed from The Jersey Bulletin

Prof. E. J. Perry

Rutgers University

THE making of a reasonable investment in superior blood as a means of herd improvement is one of the last hurdles that so many dairymen seem to be willing to clear. Yet the herds that have been classed as good for a number of years have been immeasurably helped by quality bulls. There are great numbers of dairymen who gladly pay a good price for a cow, but object to investing even $5.00 to have that cow bred to a superior bull. This statement is seldom true of an owner of purebreds, a fact that tends to show the desirability of increasing the population of our registered cattle provided they are of the profitable variety.

Co-operative Breeding Not Synonym for Cheapness

One of the dangers facing some of the new artificial breeding associations is the attempt to give service at a cost considerably less than that of natural breeding, i. e., of keeping a herd bull. An association that is under-financed can never grow and succeed. This danger should be recognized and plans made in time to warrant that each association will be properly financed, because without sufficient funds to enable it to get the use of extra good bulls the main object of the organization will be defeated.

Artificial breeding offers farmers a practical opportunity to share the use of some of the top flight bulls of the country at a cost much less than they would have to pay to own such bulls individually, but hardly at a cost less than they can get the cows in calf to a young low priced bull. Most dairymen do not have large enough herds to justify keeping an aged, proved bull. The continued use of young, unproved bulls makes dairying more of a gamble than if good proved sires were used at least part time.

A charge of $5.00 per cow (for as many as three inseminations if required) is the breeding fee for most of the associations operating to date. Dairymen who are familiar with breeding principles and who appreciate the necessity

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for good bulls, say this charge is reasonable. To those who have been accustomed to picking up a young bull quickly and asking few or no questions about his near ancestors' achievements, the fee seems too high. Let us consider a couple of figures. Some impartial judges of the bulls, both proved and unproved, that are now being used in the artificial breeding associations set their average worth at $300 as a conservative estimate. Suppose that in a certain district, dairymen could each buy a bull of this caliber. Their total investment in bulls would be $30,000 and they would use each bull about two years because they would probably not want to go in much for mating sire to daughter. The yearly investment would then total $17,500 for the group. Assuming that these 100 men were members of a well organized artificial breeding asociation and that their herds averaged 15 cows (a rather common average for many dairy sections), their yearly cost for artificial breeding at $5.00 per cow would be half of the bull cost where each would have his own bull.

It's the Bulls, Not the Method

This new system of breeding is a means to an end and not an end in itself. The goal is better dairy cattle. Scores of thousands of yearly production and feed records in the Dairy Herd Improvement Associations and from other sources show that one-third of our national dairy herd of 25,000,000 cows does not pay for the feed and labor expended on it. Only 20 per cent of the bulls proved in these improvement associations have daughters averaging over 400 pounds of butterfat on the mature ten months milking basis. By a strict culling campaign and the multiplied use of our very best sires, a most beneficial revolution in economical production would result during the next 10 to 15 years. The tool with which to get the blood of these bulls is artificial breeding. Not only can the influence of our best proved sires thus be greatly expanded, but the most promising young bulls can be quickly tried out and proved six months to a year sooner than usual. Those which prove their real worth can then be brought back into heavy service in the associations. The bull selection committees of these associations will henceforth be scrutinizing the work of the sires and cow families of the best registered herds of the country, looking for those bulls, both proved and young ones, that promise to be of greatest benefit to members. This is a challenge to all breeders everywhere to do just as scientific a job of breeding as their ability permits. A uniform system of records of production on all cows in the herd will be looked upon by these bull committees as a

complimentary ticket of admission to the breeder's farm.

In Denmark, where the first co-operative artificial breeding association started in 1936, the number of dairy cows is said to be reduced at least 20 per cent since the German invasion in the spring of 1940. But yet artificial breeding there is on the increase, according to a letter written in that country by Dr. K. A. F. Larsen on March 21st of this year and received in this country in April. He states that the 10 "breeding societies" that had been operating for many years on his home island of Samso as natural breeding groups, have all become affiliated with the one large artificial breeding association with 4,000 cows enrolled for breeding this year. The breeding fee is approximately $5.00 per cow.

The Two Roads

We are today in a challenging period of dairy cattle development. Ahead are two roads. One is the easy way that is traveled by the majority, with only a modicum of returns and enjoyment and without very much serious thinking about how to have better cattle. The other is a harder road, especially at first, with its devious windings. But with the help of the guideposts of new scientific facts it usually leads not only to more profitable goals but also to the great satisfaction that comes from making a contribution to the program of improving our country's livestock.

The newer discoveries in the preservation of bull semen, and in the treatment and management of sires mean they can be utilized to an extent unthought of a few years ago. Semen can now be diluted and stored up to four days with results as good as with that used on the day it is collected. It is difficult to gauge the potential usefulness and worth of some of our association bulls which a year or two ago had been serving only 25 or 30 cows a year. Now their influence in hundreds of herds is building interest in better cattle. Among the association members, a considerable number had previously bred their cows to the stockyard variety of males. Their calves were not greatly appreciated. Now, however, when the young progeny of these association bulls get sick the local veterinarian is called. Heretofore home remedies were usually resorted to and if a calf died the loss was not keenly felt.

Once there is first hand proof that better breeding pays, an individual's objection to the paying of an adequate breeding fee usually disappears. With the proving of more bulls every year and the checking up on more cow families, the obtaining of superior bulls both for the breeding groups and individual breeders should be easier in the future.

Possibilities of Improving Milk by Increased Nutrition Qualities in Feeds

Condensed from Certified Milk

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BEFORE considering the possibilities of improving the nutritive value of milk, it might be well to examine the character and limitations of the role played by milk in human nutrition. The problem of improving milk is to make it accomplish its natural function better, rather than to change it so that it can take over the function of some other nutrient.

Milk is frequently described as the best food used by man. In certain respects and with certain qualifications this is true. Milk is intended by nature to have the sole function of being a foodstuff. We would expect it to be more complete and more efficient than the other plant and animal materials we eat, which have or have had their own biological functions.

Milk is sometimes praised as a complete food. This is, however, an overstatement. Although the value of milk depends on the variety of its composition there are a few ingredients essential to our diet which are lacking in milk. In fact, there are two chief reasons why milk can not be truly described as a perfect or complete food. First, it is deficient in certain elements such as iron, iodine, and vitamin D. Second, it is deficient in energy content, figured on the basis of daily consumption. Suppose a quart of milk daily is accepted as about the maximum consumption for an adult. One quart of whole milk will supply 1.3 oz. of fat, 1.0 oz. of protein, 1.5 oz. of lactose and almost 0.2 oz. of minerals. This is far from an adequate diet from the standpoint of energy. One quart of milk supplies 666 calories which is about one-fourth the requirement of an adult with a sedentary occupation. To get people to drink more than one quart of milk a day would mean changes in instinctive tastes, long standing customs and economic restrictions.

Thus we see that milk is

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limited to use as a supplementary food. Its chief value as a dietary supplement is due to the wide variety of substances found in it; notably the vitamins. In fact no one knows the number of compounds present in milk.

It might be stated that the chief value of milk in the diet is due to two groups of compounds found in milk. First, those substances not found in any other nutrient, for example, the lower fatty acids, lactose and casein. Second, those substances found in milk which are apt to be lacking in man's diet, namely, calcium, phosphorus, fat, the fat soluble vitamins, vitamin C and the vitamin B complex.

Taking this as our picture of the role of milk in nutrition, we may ask in what ways milk could be improved. Increasing the amounts of the lower fatty acids, lactose, or casein would be about the same as increasing yield. Milk already has enough of these materials to be without competition. None of these materials is specifically required in the human diet.

Milk could be improved by enriching it in those compounds which are apt to be lacking or in deficient amounts in the human diet. This would be true not only for those substances which are present in a very low concentration in milk, but also for those substances in which milk is rich.

In the discussion of the effect of feed on the composition of milk I will divide the milk constituents into two classes: First, those which are independent of or only slightly dependent on the nature of the feed, and second, those which can be increased or decreased by varying the ration of the cow.

Constituents of milk which are independent of the nature of the feed.

The general rule for the composition of milk is that it is independent of feed. It is easy to appreciate the importance to the young of a constant milk supply unaltered by variations in the diet of the mother. We know of exceptions to the general rule in feedy flavors as for example, garlic, which appears to filter readily through into the milk. Of course milk secretion is not a simple filtration but rather a complicated process of membrane action. The problem before us is to deal with the exceptions to the general rule of the invariable composition of milk.

There is much contradictory evidence in the literature. Perhaps in no scientific field is there so much disagreement as in the field of nutrition.

In general, the water soluble constituents of milk, i. e., those in the milk plasma are independent of feed. The important minerals, calcium, phosphorus and iron are constant. Most workers agree that increasing the feeding level

10 fold for these minerals has no effect on their concentrations in milk. Also the cow will supply calcium, phosphorus and iron to the milk in the normal amount even when they are absent in the food. Entire absence of these essential constituents will decrease the yield of milk without altering the composition.

Casein and lactose are also independent of the diet. The amount of casein and lactose produced depends directly on the yield of milk which can be influenced indirectly by the effect of diet on the health and the production level of the cow.

Vitamin C or ascorbic acid is also independent of the diet. No success has been achieved even by large excess of vitamin C in the diet. In fact it is generally believed that the cow does not need ascorbic acid for its own nutrition, or in order to supply it in the milk. There is, of course, no question about the importance of vitamin C in humans. The 20 mg. available in a quart of fresh milk are a valuable addition to human diet which usually contains less than the amount the tissues can absorb.

Riboflavin, or vitamin G, exhibits some seasonal variation which is due to the change of feed. This variation is significant and amounts to a twenty per cent increase when the cows are put out on pasture. If grass silage is substituted for corn silage in winter feeding, there is no observable seasonal increase when the cows are put out to graze.

About 2 mg. of riboflavin are present in a quart of milk. This is sufficient for the daily requirements of an adult. Riboflavin is the green pigment in whey. It is the causative agent for the oxidation of vitamin C by light. Recent work has shown that about five per cent of the total riboflavin in cow's milk is bound to protein. This bound flavin or flavoprotein is a red pigment and is associated with the fat. It is the red pigment seen in buttermilk made from raw cream.

Cow's milk is unique in its content of riboflavin. Mare's milk (and other milks) are lacking in riboflavin in the unbound form but mare's milk contains four or five times as much bound flavin as cow's milk. The bound flavin is just as active as a vitamin as is the free flavin.

Vitamin B1 or thiamin is present in milk and is variable in amount but is independent of feed. The thiamin is now known to be produced by bacteria in the rumen of the cow and from there it reaches the milk. Riboflavin, nicotine acid and vitamin B are also produced by bacterial action in the rumen.

Although the cow is unable to synthesize the water soluble vitamins, with the exception of ascorbic acid, they are present in milk in an amount which is practically

independent of the composition of the ration. In this respect the secretion of the vitamins is different from casein and lactose. In the case of the water soluble vitamins there are certain maximum values for concentration in milk which can not be exceeded no matter how rich the diet. The milk will always contain its normal concentrations of water-soluble vitamins unless the diet is very poor.

The chief exception to the general rule that the water soluble constituents of milk are independent of diet is iodine. Iodine is completely lacking in milk unless present in the feed and then it can be increased to levels as high as 0.7 parts per million. Iodine can be fed either as potassium iodide or as iodized fat. Only a few per cent of the iodine fed reaches the milk. The behavior of iodine suggests that it first is taken up by the fat before entering the milk. Iodine can be supplied to human diet much more inexpensively than by the indirect method of feeding it to cows. This is also true when seaweed is used as a source of iodine for cattle feed.

Constituents of the milk which depend on feed.

In general the composition of the milk fat can be made to vary by altering the feed. Strangely enough, the fat content itself is independent of the diet but does not vary with several conditions, notably the number of milkings, the beginning and end of milking, the age of the cow, season, temperature, etc. The amount of fat in milk is more of an economic than a nutrition problem.

The most important constituent which varies with the diet is vitamin A. Carotene in the feed is the source of vitamin A in the milk and both carotene and vitamin A are present. In the highly colored Guernsey and Jersey milk the transformation of carotene to vitamin A occurs to a slight extent, while in Holstein milk the transformation is more nearly complete. It is immaterial from the standpoint of human consumption whether vitamin A or carotene is present. As far as total vitamin A activity is concerned there is no significant breed variation. That is, based on equal quantities of fat, the vitamin A content of such milks as Guernsey and Holstein are identical. There are, however, large seasonal variations. Summer milk averages about three times as much carotene as winter milk. Grass is the best source of carotene.

Not only is vitamin A the easiest constituent of the milk to vary but it is also one of the constituents often present in insufficient amounts in human diets. The amount in a quart of milk is insufficient for an adult's daily requirement.

Vitamin D is higher in sum-

mer than in winter. There has been some discussion as to whether this was due to grass or to sunlight. Irradiating goats has a pronounced effect on the vitamin D content of the milk. When the sun shines on a cow the production of vitamin D is slow but sufficient to account for the difference between summer and winter milk. Vitamin D is sensitive to feeding similarly to vitamin A. It is possible to supply the daily human requirement of vitamin D in a quart of milk if the cows are fed irradiated yeast.

The yellow color in the milk is supplied chiefly by carotene and is of great economic significance. The problem here is to develop methods of preserving the pigments in silage.

Conclusions.

Iodine and a few of the fat soluble constituents notably vitamins A and D are the only substances in milk which are greatly dependent on feed. From the practical standpoint for some of the other constituents it is possible to improve the quality of milk by selection of individual cows. However, selection of cows offers many complicated problems.

The quality of milk with respect to color and flavor can be improved by feeding. There is some practical advantage in increasing the yellow color of milk because of popular demand for a yellow market milk.

The facts which I have presented are meager and in some cases admittedly uncertain. Only about a dozen compounds have been mentioned in a product which contains nearly everything found in living materials. How many compounds are present in milk and which of these are essential to human diet is still unknown.

A Good Living on 40 Acres

Condensed from Soil Conservation

A. L. Harrell

District Conservationist, North Central Alabama Soil Conservation District

HE found a four-leaf in his crimson clover patch, but he didn't just sit down and wait for Lady Luck to change her attitude—not Bill McClellan. Bill is a Negro farmer of Calhoun County, Ala., and he does admit that having a few four-leaf clovers on his farm "didn't hurt none." There is no question about it, crimson clover has had a lot to do with helping him to make a better living for his family of six from his 40-acre farm.

Back in 1935, Bill was producing around 125 bushels of corn on 14 acres, 5½ bales of cotton on 9 acres, and 2 tons of hay from annual crops planted on 4 acres where oats failed. The only other income was from vegetables, meat, and a few chickens raised for home use.

The 40 acres he had bought a few years before with money saved from a railroad job was beginning to look more and more like a bad investment. Bill was about ready to go back to railroading when Soil Conservation Service technicians of the old Anniston demonstration area helped him work out a complete conservation plan for his farm.

Corn following crimson clover began to show a big increase in yields the first year. In 1939 and 1940, he averaged 355 bushels of corn on 12 acres, 5¾ bales of cotton on 6½ acres, 7¾ tons of hay on 7 acres, 60 bushels of oats on 2 acres, 57 bushels of wheat on 2¼ acres, and approximately 2,000 pounds of unhulled crimson clover seed on 2 acres.

At prevailing prices, the total annual value of increased crop yields was $448.13 in 1939 and 1940, with cotton and cotton seed accounting for only $13.88 of it. The largest single item came from the increase of 230 bushels in corn yield.

Bill "made out" in 125 bushels of corn in 1935 when that was all the corn the farm produced. Then when this crop increased to 350 bushels he sold only 100 bushels and used the remainder on the farm. Although the hay crop in 1939 and 1940 was more than twice what it was in 1935, he sold only a part of the additional yield.

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In other words, when corn and hay were more plentiful, the livestock kept on the farm were better fed than when he had to "make out" on a small amount of feed, and in addition he had a small surplus of feed for sale from his 40-acre farm.

Bill was not growing any winter legumes in 1935, when the conservation plan was worked out for the farm. In 1939 and 1940 he planted approximately 20 acres to crimson clover from seed produced and harvested on the farm. The crimson clover that was turned under accounted to a large extent for the striking increase in corn yield and also provided winter protection against sheet erosion on his cropland.

All the hay produced on the farm in 1935 was from annuals, but the greater portion grown in 1939 and 1940 was from 1 acre of *Lespedeza sericea* and 4.7 acres of kudzu. The kudzu was planted on land that had been abandoned because of erosion. It is estimated that after the kudzu has become well established, an annual hay yield of approximately 10 tons will be realized from the 5.7 acres of *Lespedeza sericea* and kudzu.

In addition to the idle land planted to kudzu, one-half acre of it was converted to woodland, and his pasture was increased by three-fourths of an acre. The pasture has been fertilized and mowed, thus increasing its carrying capacity. Improved terraces were constructed on 32 acres of cropland and a meadow outlet was established to take care of water from the terraces. A wildlife border strip was established between the woods and cultivated land. Kudzu was planted along roadsides to protect banks from further erosion.

Annual lespedeza was seeded on all small grain and could have been mowed for hay if it had been needed. Lespedeza seed is being produced for additional plantings that will be required in the cropping system. No annual lespedeza was grown on the farm before the conservation plan was developed.

This 40-acre farm is making a comfortable living for its owner and his family, and its soil resources are being conserved through a sound land-use plan with every part of the farm utilized according to its capability. There is not a waste acre on the farm and the soil-conserving vegetation that is being grown for the protection of land against erosion is augmenting the supply of forage, improving the fertility of the soil, and increasing both acre and total yields of the various crops.

Like most good farmers, Bill is a good citizen. He is a leader among members of his own race in his community and has been directly responsible for several conservation plans that have been developed on neighboring farms

first in co-operation with the Soil Conservation Service project and more recently with the soil-conservation district of which his community is a part. His farm has been visited by numerous groups of both white and colored farmers and the excellent demonstration of what can be done on a small acreage has encouraged many of them to apply for assistance in developing conservation plans for their own land.

Bill McClellan has proved to the satisfaction of those who have visited his farm that it is possible to develop a sound farm program on a small acreage without large cash outlay. Through the wise use of his limited financial resources, he has increased the value of his property and has made his farm produce a much larger income than he was receiving before his conservation plan was established.

Instruments Spread Disease

Typhoid-fever carriers like the famous Typhoid Mary have counterparts in the animal world. Bovine carriers spread Bang's disease, mastitis, and what is now known as anaplasmosis, among other cattle, says the U. S. Department of Agriculture. Anaplasmosis has long existed in the United States, probably for as long as has tick fever, but during the last ten years it has been recognized as a distinct disease. Anaplasmosis resembles tick fever and is sometimes confused with it. Each disease is caused by a parasite which gets into the blood stream of the animal. It is sometimes difficult for a veterinarian to tell one disease from the other, without resorting to laboratory examination.

Carrier cattle show no symptoms of anaplasmosis, and cattlemen or farmers may be unaware of the danger of infection. Scientists who have studied the disease at the U. S. Department of Agriculture pathological laboratory in cattle country in Colorado say that cases occurring in winter—the off season for flies and ticks—usually are spread by instruments used in dehorning, "tipping" the horns, and other minor operations. Cattlemen may dehorn infected cattle and carry the disease to healthy cattle on instruments. The Department of Agriculture recommends disinfection of instruments by boiling in soda solution or dipping in a freshly made two percent lye solution or other reliable disinfectant of like efficiency.

—U. S. Dept. of Agriculture

Lumbering Trims Its Waste-Line

Condensed from Nation's Business

O. A. Fitzgerald

SENTIMENTAL conservationists have long accused the lumber industry of excessive waste because, on the average, only a third to a half of each tree cut winds up as lumber. Unused parts amount to a woodpile estimated, for West Coast operations alone, at around 50,000,000 tons a year.

Let us examine the charge—and the waste pile—from the standpoint of the accused:

You can't cut trees into sawlogs without having stumps, limbs, and long, rough, tapering tops left over. You can't saw square-cornered boards from round, tapered logs without getting more waste. Lumber people, too, have deplored this waste.

About a decade ago, it told its critics their accusations were unjust:

If you really want to trim that waste pile, first get scientific research busy finding profitable ways to utilize the waste. As research develops new uses for waste, you can count on the industry putting them into commercial production.

Research accepted the assignment with high enthusiasm. Already it is possible to vision a time when sawdust, shavings, low-grade lumber, bark, and other waste will appear as synthetic lumber, new plastics, or as an array of by-products such as now come from coal-tar. It is equally easy to vision portable plants following logging operations to grind up the left-over parts of the tree for new industrial uses.

At its 1940 convention, the National Lumber Manufacturers Association appointed a committee to consider a research laboratory to develop new outlets and new wood products.

Right now sawdust and shavings are doing their bit in national defense. Three Northwest army camps are using hundreds of tons of "Pres-to-logs," a fuel made from sawmill waste, every month. Every day during March, 50 to 100 tons of these fuel logs went from the Potlatch Forests mill in Idaho to a camp near Seattle. Coast mills supply the other camps. This new fuel, which is clean, splinterless, easy to handle, has high heat value, and practically eliminates the danger of fire started by sparks,

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was developed by R. T. Bowling, engineer with Potlatch Forests. In 1930 he designed a machine which crushes the wastes into a log-like cylinder, four by twelve inches, under terrific pressure. Other lumber companies adopted this process and last year 35 machines turned out about 120,000 tons of the new pressed wood fuel. Newest development is a process by which this wood waste fuel can be made into inch-diameter pieces for use in a standard coal stoker, thus opening even bigger markets.

Fuel from wood waste could assume an even greater role in national defense, if the situation demanded, says Dean D. S. Jeffers, of the Idaho School of Forestry. Bowling's machines could take over the major part of the job of supplying domestic fuel in areas with adequate tonnages of wood waste, thereby eliminating the need of shipping oil and coal—vital for war operations—into those sections. Such an emergency probably never will come, but this illustrates what could be done if necessary.

Other national defense uses of wood products cited by the U. S. Forest Service include cellulose and nitro-cellulose for high explosives, charcoal for gas masks, glycerol for nitro-glycerine, and, mixed with sawdust, for dynamite. Resin is used to fill spaces between the shrapnel. Turpentine is used in flame throwers.

Plastics from sawdust probably will be showing up as instrument panels, switchboards, dial knobs and similar parts of fighting planes. Wood and plywood are used in training planes. One German factory is reported to be turning out three fighter planes made of compressed, laminated, resin-glued wood daily.

Plane manufacturers in this country already have demonstrated methods that give promise of all-wood fuselages and wings.

Within the past year, Bowling has developed a machine which makes several narrow boards into one wide one by applying heat and pressure to synthetic resin spread on the edges of the boards to bond them securely. These built-up boards have been soaked in water 100 hours, dried, soaked again, dried, soaked again, dried and put under pressure to test their strength. Every time they split in the grain of the wood rather than the seam.

For national defense reasons, there has long been a feeling that the West should have more steel plants. Lack of coke has been the stumbling block. Charcoal, often tried, was never satisfactory in blast furnaces. Last year, Dr. Stevan Ruzicka, who came to America from Yugoslavia in 1935, told the National Farm Chemurgic Conference about a new process which may overcome this obstacle.

Dr. Ruzicka burns wood waste into charcoal, which is then ground into a powder. An organic binder is applied to the powder and, upon heating, it is cemented back into lumps. This product has performed satisfactorily in blast furnaces.

Wasted Bark Becomes Useful

In California vast quantities of Redwood bark were once peeled and burned in the woods because the tough and fibrous bark had to be removed before the log was sawed into lumber. Now one company shreds this bark and uses it as a filler for roofing papers and for insulation, an outlet which takes ten to 20 per cent of the total bark available each year. Redwood bark has been tested as floor covering in poultry scratching pens, indoor tennis courts, tracks, and polo arenas.

"Every time the bark can be utilized profitably, it helps the practice of forestry and the conservation of the trees themselves," observes Prof. Emanuel Fritz, of the University of California, whose energies are devoted to the cause of Redwood research and better forestry.

Throughout the nation, probably 30,000 to 40,000 tons of wood flour are made from sawdust and shavings annually—half being used as filler for linoleum, a quarter in explosives, and a quarter in plastics. Two Pacific Northwest companies make insulation and soundproofing boards from wood waste. One of these concerns provides an example of double waste utilization. Sawmill waste is shredded and treated with waste chemicals recovered from gases from a nearby smelter which once contaminated the air for miles around. The product is a mineralized fiber board, similar to the so-called artificial stone made in Europe, excellent for insulation and sound-proofing.

Seeking a Use for Brush

"If some practical uses could be found for the debris and brush left on an area after logging, one of the greatest problems confronting foresters would be solved," commended Dr. Ernest E. Hubert, Research Technologist with the Western Pine Association. "It would remove a tremendous fire hazard and eliminate the cost of brush piling and burning. The needles of conifers yield some excellent oils used for perfume and there are many chemical ingredients in logging slash which may prove of future value to mankind. The newly developed process of manufacturing camphor from turpentine obtained from pine stumps and logging refuse is another example of our release from dependence upon costly exotic products."

Down South, 51 pulp mills last year produced more than 2,500,000 tons of pulp or about 40 per cent of the nation's production against 100,000 tons 20 years ago.

Research there is also trying to convert tops and waste from pine logging operations into pulp. Out at the University of Washington, scientists have developed a new process by which a strong paper can be made from Douglas fir waste, hitherto not considered suitable for the pulp industry.

Despite this progress, the wood waste pile remains an enormous challenge. It has been estimated that, of all our remaining timber, probably 75 per cent properly may be regarded as potential raw material for the research men.

"To my mind, the broad field of synthetic boards holds great possibilities," says Dr. E. C. Jahn, professor of wood chemistry at the New York College of Forestry. "The idea that wood waste can be torn apart and recast into any desired shape and serve as a substitute for wood itself is the incentive behind the growing nation-wide interest in wood waste utilization research."

In the wood utilization laboratory at the University of Idaho, where Dr. Jahn worked with wastes from western forests for eight years before going to New York, he showed me pieces of "laboratory lumber" made by converting wood waste into a putty-like paste, molding it, and curing the pieces under heat and pressure.

These cured pieces are twice as strong as the original wood, resist water, can withstand much banging around, yet can be sawed and worked like ordinary wood. Various color effects were obtained by adding chemicals to the paste.

It has been found that different pressures determine the kind of synthetic board produced. When the squeeze is highest and the temperature hottest, a darker-colored board resembling maghogany comes out. Lessening the pressure results in a board with a lighter color, like oak.

In western experimental laboratories, wood from little-used species has been made into synthetic boards which appear suitable for the exacting uses now filled by some of the more expensive hardwoods.

The field of synthetic boards provides a conspicuous example of the industry's alertness for opportunities to trim its waste-line. Back in 1924, the waste burner at the Wausau Southern Lumber Co. at Laurel, Miss., was devouring hundreds of tons of waste every day. W. H. Mason, for 17 years associated with Thomas Edison in research, developed a process by which the chips are "exploded" under steam pressure into thousands of minute fibers which can be pressed into boards which show no tendency to warp, chip, split, splinter, or crack.

This line of products, known as Masonite, is finding its way into a wide range of uses. Near the site of the trash burner that

started Mason on the research trail stands a huge plant now turning out 300,000,000 square feet of these products from waste every year.

Chemistry Adds New Uses

Research has also learned to remove pitch from common lumber. At the Madison laboratory, remarkable progress has been made in waterproofing and fireproofing wood by forcing chemicals into it under high pressure.

In wood preservation, new developments are coming with amazing rapidity.

A Washington company has put into commercial operation a new process, Permatol, developed by Dr. E. E. Hubert, research technologist with the Western Pine Association, which makes window frames, general millwork, and exposed wood products more resistant—at low cost—to moisture and decay. University of California research chemists have developed a wood preservative, Chemonite, which protects wood used as sills, posts, piles and similar purposes against termites and fungi.

Local Timbers May Gain

Dr. Hubert reports that the use of Permatol without pressure in treating ties, mine timbers, highway timbers, telephone and power poles cut from little-used species, such as lodgepole pine, opens up local markets for these materials which previously could not gain a foothold against the competition of pressure-treated wood shipped in from outside.

Although most progress to date has come in the field the industry calls mechanical utilization, from now on the chap to watch is the industrial chemist. He is looking at our forests as complex organic structures of cellulose, lignin, carbohydrates, and resins.

A tree is about half cellulose, the most abundant and widely distributed organic product in nature, and progress has been made in turning this cellulose to profit.

About a quarter of the weight of wood is lignin which has been called "the greatest economic waste in the world." The one who hates the most to have to waste it is the man who produces it—the lumberman.

Although uses for lignin are limited at present, many chemists believe that it holds as great a promise as coal tar. Lignin plastics are already appearing. Its eventual use as panels and instrument boards for automobiles, even fenders and larger parts of car bodies, and airplane wings is freely predicted. An automobile manufacturer is testing out lignin plastics as a solid dust-proof lining for an automobile trunk.

Chief point of interest about lignin plastics is their cheapness. At the Madison laboratory, plastics have been made from a variety of trees: maple, oak, hickory, gum, and aspen. Several patents already have been ob-

tained. At the University of Idaho interesting new plastics have been made from the lignin from western softwoods. The Madison laboratory also reports extraction from lignin of several new chemicals which promise to be worth testing as insecticides.

The chemist is giving close attention to the so-called despised species of trees. In every forest area some trees are many times more valuable than others; hence they are cut first.

Before 1929, for example, larch was so shunned in the Pacific Northwest that courts ruled a contractor liable for damages if he substituted it on a job without the owner's approval.

Although larch still continues a less valuable tree, its status has improved. Chemists have found a new way to make high-grade paper pulp from larch. Some day it may become an important source of cellulose for the manufacture of synthetic fibers.

At the Idaho School of Forestry, Dr. E. V. White has found that 12 to 18 per cent of the weight of larch is *arabogalactan,* a gum which can be dissolved in water. It is similar in many properties to pectin (used in jelling fruits) and to gum arabic and gum tragacanth, used extensively as emulsifying agents. All our gum arabic and gum tragacanth is now imported.

A lumber company is considering a pilot plant to explore the commercial possibilities of *arabogalactan.*

Because the chemical composition of woody tissues is relatively the same in all trees, the so-called inferior trees of today may become superior trees of tomorrow.

New Fuels from Waste

Wood wastes for motive power —utilizing the combustible gases to run engines—has long appealed to scientists. In Germany, France, Italy, Sweden, Japan, and Russia, automobiles and trucks have been powered this way for years. Twenty-five pounds of wood roughly equals a gallon of gasoline. California Redwood people are flirting with the possibility of using some of their waste this way, particularly in remote mountain areas where the gasoline haul is excessive. A sawmill in British Columbia is powered entirely by gas generated from its own waste.

All these scientific triumphs are but the beginning of a new era in scientific utilization of trees and greater competitive range for wood in all its forms. Apparently the industrial chemist will never be happy until all of the tree has been profitably utilized.

A Pond of Your Own

Condensed from The Southern Agriculturist

Walter L. Rice

FARM or country home acreages that are well watered are enhanced in value, as a rule, if fish ponds are included in their assets. Fish are the cheapest form of meat that may be produced, once the expense of pond building is past, and quite often that is also negligible. Especially is this true if natural draws or ravines are present along the stream. On hundreds of farms there are small but steady flows of water that a good earth dam and a few days of labor will turn into enchanted acres that will pay huge dividends. Larger brooks and small creeks may also be utilized in some locations without great expense.

In preparing earth dams it is well to remember the following details:

A flow of 75 gallons of water per minute is sufficient for an acre pond.

A mixture of one part clay to two or three parts gravel or gritty material seems to be highly satisfactory for earth dam construction. Other soil materials are also used with success, and some of these are given a backing of tightly spaced boards on the water side.

An earth dam's bottom should be about five times greater in thickness than the top. Thus a dam whose top is six feet across should have a bottom of approximately 30 feet.

The slope of the dam should be three to one on the side next to the water and two to one on the other side.

The top of the dam should be at least four feet higher than the bottom of the spillway or pipe outlet in order to take care of flood waters or wave action.

In building a dam, a flume, trough or pipe large enough to carry off the water should first be installed along with a small temporary dam above the selected site. This will enable the water to be carried over the construction of the real dam. Then a core should be dug down to bed-rock. This should be filled with the clay and gravel mixture and thoroughly tamped. It is highly desirable to place a layer of fine mesh hardware wire in the center of the dam to prevent muskrats from tunnelling through the structure.

A concrete spillway may be provided. In small ponds a large pipe with an elbow reaching to

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the desired surface of the pond will be sufficient. In addition there should be another pipe through the dam with a valve. This should be at such a height as to drain all but a small area of the deepest part of the pond.

A sizable portion of the pond should be at least six feet deep. If any portion of the pond is excavated it is well to remember that the top soil should be removed and placed to itself until the soil removal is completed. It should then be returned to the bottom of the pond. Many people overlook the fact that the bed of a pond should be fertile if it is to produce fish in numbers.

In some locations it is possible to conduct water from streams that are too large for convenient dam construction to low or excavated areas. Often a large pipe is sufficient for an inlet. A valve may be added to cut off the water in time of freshets. A similar pipe may be used as an outlet.

When a pond is completed it is highly desirable to allow the dam to settle for some time before water is turned in. If possible drive cars and wagons, cattle and horses across construction of this kind to pack it firmly. If a stand of grass can be secured later, it is highly desirable.

Small ponds will produce some fish, but if it is at all possible they should be at least one acre in area. Water areas of this size should produce from 8,000 to 16,000 fish per summer, depending upon the variety of fish and the fertility of the pond bed. Probably all ponds should be stocked with bull head catfish. They tend to keep waters clean of contamination from most small, dead organisms. A few wide boards of four foot length driven into the bank level with the pond bottom will furnish shelter for their eggs as they will bore back into the mud beneath the boards. Grown in unpolluted waters, catfish are also excellent eating.

Most sportsmen will stock their ponds with black bass. They furnish unexcelled sport, but so far as I am concerned (unless the pond was at least of two-acre size) I would prefer such pan fish as blue gills, also known as blue bream, other sunfish, calico bass, and similar species, along with the catfish. Here one would get a maximum number of fish and would not have to wait so long a time between bites.

It is quite generally agreed that ponds should be partially drained for a time each year to permit the removal of excessive plant growths. Probably winter will be found the best time for this purpose. For the production of an abundance of fish it is necessary to have plant growth in ponds. The plants manufacture food for various minute organisms upon which little fish feed.

Then the larger fish feed on the small ones, and also absorb through their gills the oxygen set free by green plants.

The following plants have been recommended for fish ponds: spiked water milfoil, more commonly known as foxtail, fanwort, hornwort, and chara. Cattails and water lilies are less efficient in the actions noted but furnish shade and hiding places. They have to be removed from time to time, however, in order to prevent their tendency to take the whole pond. Properly fertilized ponds are said to produce from two to four times as many fish as those unfertilized, therefore the fish crop should be fertilized along with the cotton, corn and vegetable crops.

Where ponds can be created on fair to good land at reasonable cost, and are properly handled, they will prove to be of considerable monetary value as well as of great recreational and health-yielding importance.

Hens Can Be Made To Set

EXPERIMENTS recently completed at the Alabama Experiment Station by D. F. King show that hens may be induced to set at the time desired. The method is simple, quick and inexpensive. If the directions are followed closely, the mothering instinct of the hen will be stimulated into action in about four days. She will then set on eggs or brood chicks as any other setting hen. The procedure is as follows:

1. Catch, at night, the number of hens you wish to set.
2. Place them in a coop without feed or water.
3. The next night (24 hours after catching) feed each hen a little grain and let her drink. Then place her on a nest about 12 inches square containing 4 or more hard-boiled eggs and 2-day-old chicks or 10 hard-boiled eggs. The front of the nest should be covered with a burlap sack to keep the hen in and the nest dark.
4. The hens and chicks should not be disturbed except to feed them once daily.
5. The hens will start setting in about four days. They may then be given eggs to hatch or chicks to brood.
6. The same chicks may be used to stimulate a second or even a third group of hens.

If the chicks are not used only about half of the hens treated will be stimulated to set.

Summer Care of Work Horses

Condensed from The Farmer

A. L. Harvey

THE farmer who gets the most work from his horses is the one who takes the best care of them at all times. He does everything he can to keep them comfortable when at work and when idle.

Horses are like soldiers in that they must go through a period of training and muscle hardening to stand up under a rigorous campaign. Furthermore they must be kept "in condition" throughout the working season.

Galled shoulders and sore necks decrease the horse's efficiency and may become serious enough to prevent him from working. Most of these troubles are caused by collars and hames that do not fit. Each horse should have his own collar of the shape (straight-faced, half-sweeny, or full-sweeny) that fits his neck. It should be wide enough to allow a man's fingers to pass up and down along the side of the neck between the collar and neck. It should be long enough so a man can put three fingers between the collar and the throat when the collar is pressed back against the shoulders. Collars that fit well in the spring may become too large later on. This situation may be remedied by use of a pad. The best kind of pad to use is one faced with oilcloth. It is cooler, easier to clean, and lasts longer than cloth faced ones.

It is just as important to have the hames fit the collar properly as it is to have the collar fit the horse's neck. The hames should fit the rim of the collar closely all the way around. They should be long enough so that the traces will be about one-third the way up the shoulder. The top hame strap should be adjusted so that it will lie straight across the top of the collar. If the top hame strap is in the shape of an inverted U, the pull of the tugs will spread the hames at the top and cause sore shoulders.

After the harness is removed, the shoulders should be washed with warm water and soap, then rinsed with cold water to which a handful of salt has been added. This treatment toughens the skin and should be continued throughout the summer and fall. Sore spots may be covered with zinc-oxide ointment or dusted with an antiseptic powder such as boric acid or alum. Small bunches on the

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shoulders should be painted with tincture of iodine. Attention paid to shoulders, necks, collars, and hames each day will pay in the long run.

Take Care During Hot Weather

Horses at work in hot weather must be watched closely so they will not become overheated. Once they have been affected by the heat they never recover fully. To avoid overheating, work them early in the morning, late in the afternoon, and in the evening. Allow them to rest often. Give them an extra pailful or two of water in the middle of the morning and afternoon.

Symptoms of overheating are a slowing up of the natural gait, a tendency to wobble in walking, rapid breathing, excessive dilation and redness of nostrils, watery and bloodshot eyes, and high temperature, accompanied by little or no sweating. If such symptoms are noticed, the horse should be taken to a shady place, its body sponged, and its legs showered with cold water. Its mouth and nostrils should be washed out and ice packs applied to the head. It is always wise in such cases to call a veterinarian.

The Use of Pasture

The extensive use of pasture for work horses cannot be overemphasized. Horses that work every day should be turned out at night while the weather is favorable. Not only does this keep the digestive system toned up, but it decreases the amount of hay needed and eliminates the necessity of bedding and cleaning the stall each day. Horses turned on grass at night may sweat a little more than those given only dry feed, but the benefits derived by being out in a clean, cool place where they can roll, graze, and obtain water at will more than overbalances this slight disadvantage.

Permanent pastures of blue grass and brome grass are good for spring and fall grazing. Sudan grass is an excellent summer pasture. Horses like it, and its carrying capacity is greater than that of the other grasses. Pasturing this crop during severe drouth or after a killing frost must be done with care as there may be danger of cyanide poisoning. However, horses are not so susceptible as cattle and sheep. Alfalfa and red clover are also very good. Sweet clover can be pastured to good advantage in certain sections, but horses pastured on sweet clover should have some dry roughage available. Alsike and white clover are excellent in a mixture with red and blue grass.

They Show Their Wares

Condensed from American Poultry Journal

A. O. Braeger

COMES the first Monday of each month and it's Fair Day at Hales Corners, Wis. This wide-awake country village located in the southwestern part of Milwaukee County has its fair 12 times a year regardless of rain, snow, holidays or come what may.

It's not a fair where prize livestock or poultry are shown; no races are featured to attract a crowd; and the carnival atmosphere, so evident in most county fairs is conspicuous by its absence. It's just a fair where farmers, their wives, and children, for miles around bring farm produce, livestock, and poultry into town to sell to the hundreds of people who come to buy.

This past September we visited Hales Corners on Fair Day, and as it was the first Monday in the month, the day was also Labor Day. We arrived at 9 in the morning, and at hour the mile long street of the village was already taxed to capacity with trucks, trailers, cars, and people. Farmers with their loads of produce were parked along both sides of the street. The crowd, estimated to be betwen 4,000 and 5,000 people, was made up of farmers, village folks, and city people.

To get a good understanding of what this particular fair has meant to southeastern Wisconsin farmers and why it has been so successful, a bit of history of the event is needed.

The exact year the fair started is not known, but according to Irvin Cobb, one of the oldest residents of the village and the only member of the Hale clan still residing in this area, it was about 72 years ago.

In the late 1860's, the few business men of the village originated the idea of having some type of a monthly sale or fair in order to get the farmers into town and to get a better spirit of co-operation in the community. The first fair was held, and a yoke of oxen and a team of horses were sold. From that day on the fair has been held the first Monday of each month.

In the early days, the fair was an event which lasted all day and night, and nothing but livestock was sold. Cattle, horses, sheep, and pigs were brought in, tied up to hitching posts, and then the selling began. Now the fair has changed somewhat. It seldom

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last more than a half day, and every type of farm product is offered for sale. Pickles, peppers, sweet corn, dill, potatoes, flowers, pigs, calves, goats, pigeons, chickens, ducks, ducklings, geese, honey, apples, pears were being sold at the Labor Day fair. Of course, the products offered for sale vary with the season.

We talked to Ray Pahle, Route 1, West Allis, Wis., a poultry farmer, who brings a load of poultry to Hales Corners every fair day. On this particular day, he had chickens, broilers, ducks, and pigeons on his truck. He was selling 5 lb. birds for $1.00, 4 lb. birds for 75c, broilers weighing 2 lbs. were selling for 45c, 5½ lb. ducks sold for 75c, and pigeons brought 20c apiece. Some buyers took one bird, others took a half dozen chickens and several ducks.

We moved down the street several hundred feet, pushing through the crowd that was milling around a vendor selling snake oil, until we came to the spot where Clarence Buchholz had a display of honey on a table and in the trunk of his car. Mr. Buchholz is a farmer—a bee farmer—and has 100 hives of bees. The golden brown honey on the table was put up in 1 lb. glass jars, 3 lb. glass jars, and in 5 and 10 lb. pails. The 5 lb. pail selling for 50c was an especially good seller. On some fair days, he has sold as much as $38 worth of honey. "Why do I attend this fair? Well, it's a mighty good way of finding new customers," said Mr. Buchholz.

Across the street stood a truck with bushels of early fall apples and pears. The truck and apples were owned by Harold Pasbrig, a young fruit farmer.

Moving still further down the street, we came to a trailer loaded with young pigs. Herman Woelding was busy transferring two pigs he had just sold to another truck. He is the hired man for Adolph Seifert who has a 250 acre dairy farm, and his load of pigs averaged 50 lbs. The two pigs just sold brought $4.00 apiece or about 8 cents a lb. Top market quotation for that day as given by the Milwaukee stockyards was $7.50 for fat hogs. "My boss or I usually attend every fair, although we don't bring something to sell every time," said Woelding. "In most cases we seem to get a better price for pigs, or whatever we happen to have, by selling them here than if we marketed them through regular channels."

Near the end of the street was a small truck loaded with peppers, pickles, sweet corn, tomatoes and pears from the M. Berka farm. Mrs. Berka was selling dill pickles at $1.50 a bushel, small pickles for 30c a hundred, and peppers 50c a half bushel. The Berkas have two truck farms, one 62 acres and the other 40 acres. Mrs. Berka was born

and raised in the vicinity of Hales Corners and has been attending the fair for over 45 years. "I came to the fair as a girl with my father," she said, "and learned to do my share of selling. Since my marriage, I have continued to do so. During the summer months, our load consists of vegetables, and during the winter months, we bring ducks." She estimated that the small load of products would net her about $20. In answer to our question, she said that very rarely does she cut her price to make a sale. "We never make a practice of price cutting, as it isn't fair to the other customers who never argue about the price," she pointed out.

There is no question of the value of small fairs like this to Wisconsin farmers. There are probably 50 other communities in the state that are holding similar events once a month or every other month. Perhaps the value of these fairs can't be judged alone by what a farmer gains through marketing products from his farm in this manner. Perhaps the real value lies in the spirit of co-operation that is developed among the people of the community or a county.

Hard Seeds Aid Legume Stands

Condensed from Eastern States Cooperator

C. W. Clemmer

HARD or impermeable seeds which commonly occur in alfalfa are those that do not absorb water (swell) and germinate under the standard laboratory conditions for determining germination of alfalfa seed. These seeds, for the most part, are alive and when planted in the field may produce healthy seedlings, but there are differences of opinion as to their agricultural value for planting. Since alfalfa seed often contains high percentages of hard seeds, it is desirable to know the comparative planting value of seed containing high and low percentages of hard seeds.

Unsound prejudices against hard seeds in alfalfa were exposed at the 1940 Alfalfa Improvement Conference held at Fort Collins, Colorado. Based on four years' tests with alfalfa seed from one to sixteen years old varying in hard seeds from one percent to 62 percent, the following findings were reported:

The percentage of hard seeds in alfalfa increases up to complete maturity of the seed crop, and then decreases with age of the seed especially in moist climates; about one-half becoming permeable in three to four years and practically all in ten to eleven years. Thus lots of fully matured but fresh seed are apt to contain the highest percentages of hard seeds.

Clipping or scarifying immature hard seeds reduces their percentage of germination, and old hard seeds when clipped have a variable percentage of germination, which is apt to decrease rather rapidly after clipping.

In field germination or seedling emergence tests, lots of seed of one percent to 62 percent seed content, when observed two to three weeks after planting, all produced practically the same number of plants. There was *slightly* better germination and quicker emergence from samples with very few hard seeds than for those with many, but the difference was not over four percent between lots varying from one percent to 62 percent hard seeds. Lots of 40 percent to 62 percent hard seeds produced fully as good a field stand as lots having 20 percent to 40 percent hard seeds.

Under favorable field conditions not more than 70 percent emergence can be expected for

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seed germinating nearly 100 percent.

There is no justification for clipping or scarifying alfalfa seed as it frequently injures seeds with thin seed coats and those which are slightly immature, makes the germination of old seed variable, and reduces the ability of all seed to withstand storage.

Seed of especially low hard seed content may be of questionable value since this condition is often associated with immature seed, or very old seed.

From another source we have the information that Professor E. R. Jackman, extension specialist in farm crops at the Oregon State College, Corvallis, Oregon, who is recognized as a leading authority on the production of Ladino clover in the United States, may be quoted as follows: "We do not regard hard seeds as a handicap of any kind, and in fact, we pay no attention to it whatever in this state. In most cases, it is an advantage to have hard seed, because it furnishes what amounts to insurance in getting stands. We have had innumerable cases where plantings would have been failures had it not been for hard seed. It is also true that under field conditions, many of the seeds which grade as hard seeds in the laboratory germinate rather promptly because of the action of chemicals, molds, bacteria, and so on in the soil.

"If I were buying Ladino clover seed, I would buy it upon *purity* and *total live seed content* (germination plus hard seed content). I would pay no attention at all to the percentage of hard seed. I can see no disadvantage in hard seed and there is some advantage. From a seedsman's standpoint, another advantage is that a lot containing a high percentage of hard seeds increases in germination for several years, whereas, a lot of seed that has been scarified begins to fall off in percentage of germination almost immediately. Thus, if a seed dealer must carry over some seed for a season or two, the unscarified seed does not deteriorate, whereas the scarified seed may."

Growing and Drying Prunes

Condensed from American Fruit Grower

Carl J. Hansen

University of California

LET me start by clearing up any confusion that may exist regarding the relationship between prunes and plums. Perhaps the following commonly given definition of a prune will help: "A prune is a plum that has the property of drying and curing without the pit being removed." From this definition it can easily be seen why instructors in horticulture will often make the statement to their students that, "All prunes are plums but not all plums are prunes." Of the numerous species of plums grown in the United States only one, the European plum *(Prunus domestica),* contains varieties which meet the requirements of our definition of a prune, and even in this species many varieties will not dry properly and so may only be eaten fresh or in a few cases canned. Since a high sugar content is one of the factors necessary for proper drying, most prunes are very sweet to the taste.

Approximately 90 per cent of the prune crop reaches the consumer in the familiar dried form with its many wrinkles, while the rest is sold fresh or canned. Most of the prunes sold in the fresh condition are grown in Idaho, eastern Oregon and eastern Washington. The varieties shipped are principally the Italian prune and the Sugar prune. In Califronia, Sugar prunes make up the bulk of the fresh prune shipments. The canning of prunes, especially of the Italian variety grown in Washington and Oregon, has become increasingly important in recent years, although more fruit is still sold fresh than is canned. Approximately 200,000 tons of dried prunes are produced annually in California and in the neighborhood of 30,000 tons in the Pacific Northwest, particularly in western Oregon and western Washington.

The French prune, as it is called on the Pacific Coast, accounts for approximately 85 per cent of the prune acreage in California. This variety is the same as that described elsewhere under the name of Agen, Prune d'Agen or Petite Prune d'Agen.

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The remaining 15 per cent of the acreage is planted to the following varieties: Imperial, Sugar, Robe de Sergeant and Burton. The Imperial and, to a lesser extent, the Sugar and Burton are larger than the French and so take care of a special trade which requires a large prune. The Italian variety, which is not grown in California, is the most important one in Oregon and Washington.

The prune growing areas of California are located in central and northern California, with the greatest acreage in the coastal counties of Santa Clara, Sonoma and Napa. Most of the remaining acreage is found in the Sacramento and San Joaquin valleys.

The French prune, because it is capable of setting fruit with its own pollen, is usually planted in solid blocks. On the other hand, the Imperial, Robe de Sergeant, and Burton require pollen of some other variety to set fruit, so a few rows of another suitable variety must be included. Since the transfer of pollen from one variety to another is accomplished almost entirely by bees, and since there is evidence that bees will increase the crop even in the case of self-fruitful varieties, growers will often place beehives in their orchards during the blossoming period.

The growing of prunes is a year round job. Shortly after the crop is taken care of in the fall, the leaves drop from the trees and pruning can begin. Except during rainy spells, this work may continue until spring, if necessary. Sometime during the winter in certain districts it will also be necessary to apply a dormant oil spray to control certain scale insects, while in others a spray for aphid eggs is required. Wooden props are often used to support heavily loaded branches, but many growers find that wires extending from the center of the tree to the main branches are more satisfactory; another job which can be done during the winter. When spring comes, the cover crop, which is either a planted one such as *Melilotus indica* or a volunteer crop of native weeds, must be disked or plowed under and enough loose soil left to build irrigation levees for the irrigation or irrigations which are necessary in most districts during the growing season. Following the last irrigation before harvest the land is again cultivated, and more carefully this time, since a very smooth soil surface is necessary for the harvesting operations, which begin in August.

The fruits at harvesting time are dark blue in color and fully ripe, in many cases having dropped naturally from the trees, although in certain districts some of the crop must be shaken off. As already mentioned, the growers are very careful to pulverize

the surface soil so that the fruits will not be bruised when they fall to the ground and so that the harvesting crew may work rapidly and comfortably. The prunes are gathered by hand into buckets which are emptied when full into field lug boxes. The orchard is picked over about once a week, in some locations as many as three to five pickings being made. Occasionally in those districts where the fruit must be shaken from the trees, a large canvas is used to catch the prunes, but this method is not feasible if the fruit drops naturally, because the fruits which have dropped to the ground would have to be picked up before the canvas could be placed under the tree. Since the picking of prunes is often done on a piece work basis, either by the box or the ton, a harvesting scene is likely to be one of considerable activity.

The next step is to haul the boxes of fruit to the dipper where the fruits are washed in a boiling hot dilute solution of lye or sodium hydroxide, or sometimes in pure boiling water if the fruit is to be dried rapidly with artificially produced heat. This solution removes the bloom (a thin waxy layer on the skin of the fruit) and makes small checks or cracks in the skin and so causes the prunes to dry more rapidly. Any dust which may have adhered to the fruit is also removed in the process. Some dipping machinery gives the fruit an additional spray of water, but this is not absolutely essential since the extremely small amount of lye present soon changes on exposure to the air into harmless sodium bicarbonate or baking soda and, in addition, the prunes are given another cleaning and sterilization just before they are placed in packages for sale.

On leaving the dipper, the prunes are spread on trays the size and shape of which depends on whether the fruit is to be dried in the sun or placed in a dehydrator which speeds up the drying process by blowing hot air over the trays. The modern dehydrator consists of two long tunnels with doors at each end. The trays of fruit are placed on small railroad cars and are then pushed into the tunnels in which a stream of air heated to a temperature of about 130 to about 165 degrees F. is circulated by a large fan.

Dehydration is used almost exclusively in the Pacific Northwest states, but in California, sundrying and dehydration are both common practices. The principal advantage of dehydration is that the drying process is completed in about 24 hours, while sundrying requires a week or two.

After the drying process is complete, all imperfect fruits are removed from the trays by hand and the remainder hauled to the grower's temporary storage bin,

where they usually remain long enough to bring about some equalization of moisture between slightly overdried fruits and those that contain a little too much moisture. The prunes are then placed in burlap sacks, holding approximately 100 pounds, for transfer to the packing house, which may be operated by a private company which has purchased the crop from the grower or by a co-operative organization owned and operated by grower members.

The California prune industry is operating under a marketing program which has as its principal objective the orderly disposal on the domestic market of that portion of the crop that was previously exported to Europe. This they hope to accomplish by a number of means, two of which I will mention. First, off-grade prunes which would tend to destroy the buyer's confidence in the quality of the product, are being destroyed or converted into by-products. Second, the whole industry is contributing to an advertising campaign which is attempting to bring to the attention of more people the many ways in which this comparatively inexpensive but nutritious food may be used.

A New Fertilizer Development

Nitrogen-Potash Topdressers

Condensed from The Potash Journal

J. D. Romaine

NITROGEN-POTASH topdressers are used for the purpose of applying additional nitrogen and potash to crops, to supplement that applied at planting time. The use of these topdressers is a comparatively new practice. The application of quickly acting nitrogen fertilizers as topdressers on cotton, corn, and the small grains in the South and on the small grains and leafy vegetables in the North has long been a common practice. Some growers, especially those in the South who were troubled with rust on cotton or firing of corn leaves, also used potash fertilizers as topdressers. The fertilizer trade, however, did not offer ready mixed nitrogen-potash topdressers to any extent before the spring of 1928.

The use of a mixed nitrogen-potash topdresser caught on slowly. Many farmers did not think they needed any more potash than they already were using, and it took time for the fertilizer trade, long accustomed to making mixtures high in phosphate, to get used to the idea of mixtures containing only nitrogen and potash. The first mixers to break the ice tried different formulas, resulting in such analyses as 9-0-27, 10-0-15, 10-0-10, and others. Gradually the 10-0-10 became the most popular grade, although 9-0-15, 12-0-12, 8-0-25, and other mixtures are important locally.

An idea as to the growth in the use of nitrogen-potash topdressers can be obtained from the survey conducted by the National Fertilizer Association in co-operation with the U. S. Department of Agriculture in 1934 and 1939. According to the data obtained in 1934, no one grade of nitrogen-potash topdresser was used to the extent of 1,000 tons. Five years later, the survey showed that nearly 12,000 tons of 10-0-10 were reported used in 10 States, this analysis ranking sixty-first in

tonnage for the country as a whole. More than 2,000 tons of 14-0-14 also were used that year, but some of this probably was nitrate of soda-potash rather than mixed nitrogen-potash topdresser. In addition, there were smaller amounts of other analyses such as 9-0-15, with less than 1,000 tons each, probably aggregating several thousand tons.

One of the principal reasons for using nitrogen-potash topdresser is to supply sufficient amounts of these nutrients in a way that is safer from the viewpoint of the farmer than applying all the nutrients at planting time. Another reason for using this topdresser is to supplement rather poorly balanced fertilizers which may be used as a matter of habit but which do not supply sufficient amounts of the plant foods for a full crop. In the latter case a heavier application of topdresser usually is necessary. The danger of loss of nutrients due to leaching also is reduced by the use of topdressers. This is more important with nitrogen than with potash, but on sandy soil particularly, potash can be leached to quite an extent during a wet season.

These factors are of importance in the growing of cotton, which may be easily injured if large amounts of fertilizers high in nitrogen and potash are applied by ordinary means at planting time in a dry season. Farmers are beginning to realize the need for greater amounts of potash to carry the crop through to a full yield at harvesting time. They are learning that rust on cotton is really the result of potash starvation. In addition, work by Neal, at the Mississippi, and by Young, at the Arkansas Experiment Stations, later corroborated at other Experiment Stations throughout the South, has shown that damage from Fusarium wilt on cotton is much worse when potash is deficient. A recent bulletin of the North Carolina Experiment Station by Moore and Rankin showed conclusively that the use of extra potash on cotton subject to rust increased the yield, gave heavier seed, heavier bolls, a higher lint index, a better grade, longer staple length, a stronger fiber, and a lower percentage of thin-walled fibers.

Farmers, therefore, are beginning to seek ways of applying more potash, but at the same time in a safe manner, so as to prevent danger of reduced yield and quality of crop due to potash deficiency. Extra potash as a topdresser was naturally thought of by cotton farmers who had been using nitrogen fertilizers in this way, but many of them did not want to go to the trouble of making two applications, or of mixing the materials before application. With the introduction of nitrogen-potash topdressers mixed by the fertilizer trade, it is

now possible to apply both nitrogen and potash in one application. Another inducement to the use of these topdressers is the fact that they are usually very reasonably priced, due to economies the fertilizer manufacturer is able to effect in the mixing of such goods, and which ordinarily would not be possible to the individual farmer. Sufficient nitrogen and potash thus can be applied at little or no extra outlay of money.

Results produced by the use of extra potash as a topdresser and profit resulting from it can be shown in a number of experiments and field trials. The North Carolina work mentioned above was carried on for two years on three different farms, with results averaged for all farms as given in Table 1.

Table 1. **Yield and Value of Seed Cotton in North Carolina, 1935-1936**

Application per acre	Yield lbs. per acre	Value cotton	Cost of potash	Net profit from potash
No extra potash	775	$31.00		
50 lbs. muriate of potash	1057	42.28	$1.00	$10.28
100 lbs. muriate of potash	1122	44.88	2.00	11.88

Only the yields are taken from the North Carolina Bulletin 308, the values used being calculated by using the conservative values of four cents a pound for seed cotton and four cents a pound for actual potash (K_2O). Ordinary fertilization with complete fertilizer was made at planting time, and nitrogen topdresser was applied on all plots. The extra potash as topdresser at both rates of application increased yields. The increases over the plot receiving no extra potash were statistically significant, although the increase of the 100 pounds of muriate over 50 pounds may not be significant, even though it was profitable. The above gains do not take into account the improved quality of the cotton and the greater ease of picking the large, open bolls which were produced with the extra potash. As a result of these highly profitable results, the authors recommend the use of nitrogen and potash topdressers when ordinary fertilizers are used at planting time on fields subject to cotton rust.

Work of the South Carolina Experiment Station has shown that it makes little difference when the potash is applied to cotton, if it is carefully laid down so that there is little or no damage due to burning. Data obtained over a period of nine years at the Sandhill Experiment Station in that State are given in Table 2, taken from the 53rd Annual Report of the South Carolina Experiment Station.

Table 2. Yield of Seed Cotton with Different Times and Rates of Applying Potash. 1931-1939. Sandhill Station

Lbs. potash applied	Time of application	Yield lbs. per acre	Value of cotton	Cost of potash	Profit from potash
None		567	$22.68		
15	All before planting	908	36.32	$ .60	$13.04
	½ before planting ½ at chopping	971	38.84	.60	15.56
30	All before planting	1250	50.00	1.20	26.12
	½ before planting ½ at chopping	1312	52.48	1.20	28.60
	All at chopping	1265	50.60	1.20	26.72
45	All before planting	1399	55.96	1.80	31.48
	½ before planting ½ at chopping	1423	56.92	1.80	32.44
	All at chopping	1385	55.40	1.80	30.92
60	All before planting	1544	61.76	2.40	36.68
	½ before planting ½ at chopping	1576	63.04	2.40	37.96
	All at chopping	1563	62.52	2.40	37.44

All plots received a basic application of nitrogen and phosphoric acid and a nitrogen topdresser. Only yield data are taken from the report, the values having been calculated as described for Table 1. It is noticeable that yields, total values, and profits increased regularly with increasing potash applications, the most profitable treatment being obtained with the highest potash application of 60 pounds K_2O per acre. At each rate of application, there is not much difference in yield with the different times of applying the potash, but there is a tendency for the highest yield to occur with half the potash applied before planting and half at chopping. The latter treatment would compare with a nitrogen-potash topdresser. The Experiment Station recommends that where large potash applications are made, part be applied at planting time and part at chopping-out time.

The South Carolina Experiment Station also conducted many field tests with varying amounts of potash applied in addition to nitrogen and phosphate on farms located on important cotton soils throughout the State. Best yields and profits were obtained with the highest potash application, but there were no outstanding differences for time of application. At the higher rates

of potash, however, there was a tendency for the best results to be produced by applying part of the potash before planting and part as a topdressing at chopping-out time. More detailed data given in the Report show that the cotton on the Piedmont Soils responded just as well to the potash applications as did that on the Coastal Plain soils.

In order to furnish data on the use of nitrogen and potash as a topdresser in comparison to nitrogen alone under actual field conditions, during the past several years the American Potash Institute has conducted many field tests throughout the cotton belt. These tests were usually conducted in co-operation with the local County Agent or Teacher of Vocational Agriculture, and were carefully supervised so as to have the data as fair and accurate as possible. In 191 tests, the regular fertilizer at planting time and nitrogen topdresser were applied over the whole field, and extra potash in the form of muriate of potash was applied to part of the field. In 34 tests, mixed nitrogen-potash topdressers were applied to part of the field, in addition to the farmer's regular fertilizer practice, and compared with part of the field not so topdressed. The data are given in Table 4.

Table 4. Yield of Seed Cotton with Potash Topdressing, 1929-1938

Application per acre	Yield lbs. per acre	Value per acre	Cost of potash	Profit from extra potash
No topdressing	1056	$42.24		
50 lbs. muriate of potash	1114	44.56	$1.00	$1.32
100 lbs. muriate of potash	1183	47.32	2.00	3.08
150 lbs. muriate of potash	1242	49.68	3.00	4.44
200 lbs. muriate of potash	1320	52.80	4.00	6.56

These tests were conducted in all the cotton States from North Carolina to Texas, and on the average showed good profit from the use of extra potash as topdresser, or from the use of mixed nitrogen-potash topdressers.

Nitrogen-potash topdressers have also been used on other crops. In South Carolina, 10 tests were conducted on small grains in which either 50 or 100 pounds of muriate of potash were applied. An average net profit of $3.57 above the cost of the potash was obtained, regardless of whether 50 or 100 pounds of muriate were used. On 23 corn tests, scattered throughout the South, an average net profit of $1.09 was obtained from the use of 100 pounds of muriate of potash topdresser, in addition to the regular fertilizer at planting time. In most cases, a nitrogen topdresser was also used. Results were rather variable, since many factors seemed to limit corn yields.

Hester has reported work in New Jersey and other States on tomatoes for canning in which the use of a nitrogen-potash topdresser would appear to be advantageous. He finds that the tomato needs large amounts of these nutrients in the middle and latter part of the growing season, while phosphate is needed when the plants are young, as well as later in the season. All the phosphate needed can easily be applied at planting time with little danger from burning, and no danger from leaching loss. Just the opposite is true with nitrogen and potash. His work suggests that many times the good effects of large applications of these nutrients at planting time were just about offset by deleterious effects on the plants of the high concentration of soluble salts or else the nutrients were lost by leaching before the plants could use them. The erroneous conclusion was then drawn that the plants did not need the large amounts of nutrients, and yields suffered accordingly. Hester suggests the use of complete fertilizer high in phosphate and low in nitrogen and potash at planting time, and the use of nitrogen-potash topdresser during the season to supply these nutrients when needed by the actively growing plant. With this system of fertilization, he finds much higher yields and better quality of fruit are produced.

Tests on numerous crops using potash topdresser are reported in Georgia Coastal Plain Experiment Station Bulletin 30. The data show that extra potash applied in addition to a complete fertilizer at planting time increased yields of sweet potatoes, tomatoes, watermelons, lima beans, and cabbage. This could be applied either as muriate of

potash, or if extra nitrogen also was needed, as a nitrogen- potash topdresser.

Nitrogen-potash topdressers usually are made up with one or more sources of quickly acting nitrogen and with muriate of potash. Unless the mixtures are applied very soon after mixing, a conditioner to keep the fertilizer from becoming hard is needed. The work of W. H. Ross and his associates in the U. S. Department of Agriculture on the granulation of fertilizers suggests the preparing of granular nitrogen-potash topdressers that would be easy to apply and that would keep in good condition.

Ailments of Young Lambs

Sore Mouth—Sore mouth in baby lambs is caused by a filterable virus, and it may be entirely prevented by early vaccination. If an outbreak occurs the most satisfactory measure of control is to treat the affected areas with a mild antiseptic ointment. Tincture of iodine, or a 2% solution of permanganate of potash may also be used. If scabs form they should be removed and the area should be treated. If the infection is taken in the early stages, one treatment may be all that will be necessary. In more aggravated cases it may be necessary to repeat the treatment every two or three days.

Sore Eyes—This is a condition which occasionally occurs with young lambs. The eyes have a tendency to water profusely, the lids become inflamed, and the eye-balls have a white, milky appearance. As soon as any condition of this nature becomes evident the eyes should be washed twice daily with a saturated solution of boric acid, and a few drops of argyrol solution should then be put into each eye with a medicine dropper.

Navel Ill, also called Joint Ill, is a serious disease caused by bacteria which enter the body of the lamb through the navel. As there is no entirely satisfactory treatment, prevention is very important. Immediately after the lamb is born the navel cord should be painted with iodine in order to prevent infection. Clean, dry, sanitary quarters are also an aid in controlling the disease.

Pinning is a trouble with which very young lambs are sometimes affected. The first bowel movements of a new-born lamb are very sticky, and they sometimes accumulate about the root of the tail to such an extent that the anus becomes completely blocked and the lamb is unable to void its feces naturally. Unless the obstruction is removed the death of the lamb may result. If the material has become hard and dry, warm water should be used to soften it, in order to avoid injury to the lamb.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Fruit Crops—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.
(See Farmers Digest, June, 1941)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

Plant Ecology—By W. B. McDougall, Regional Biologist, Santa Fe, New Mexico. Lea and Febiger. $3.00.

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

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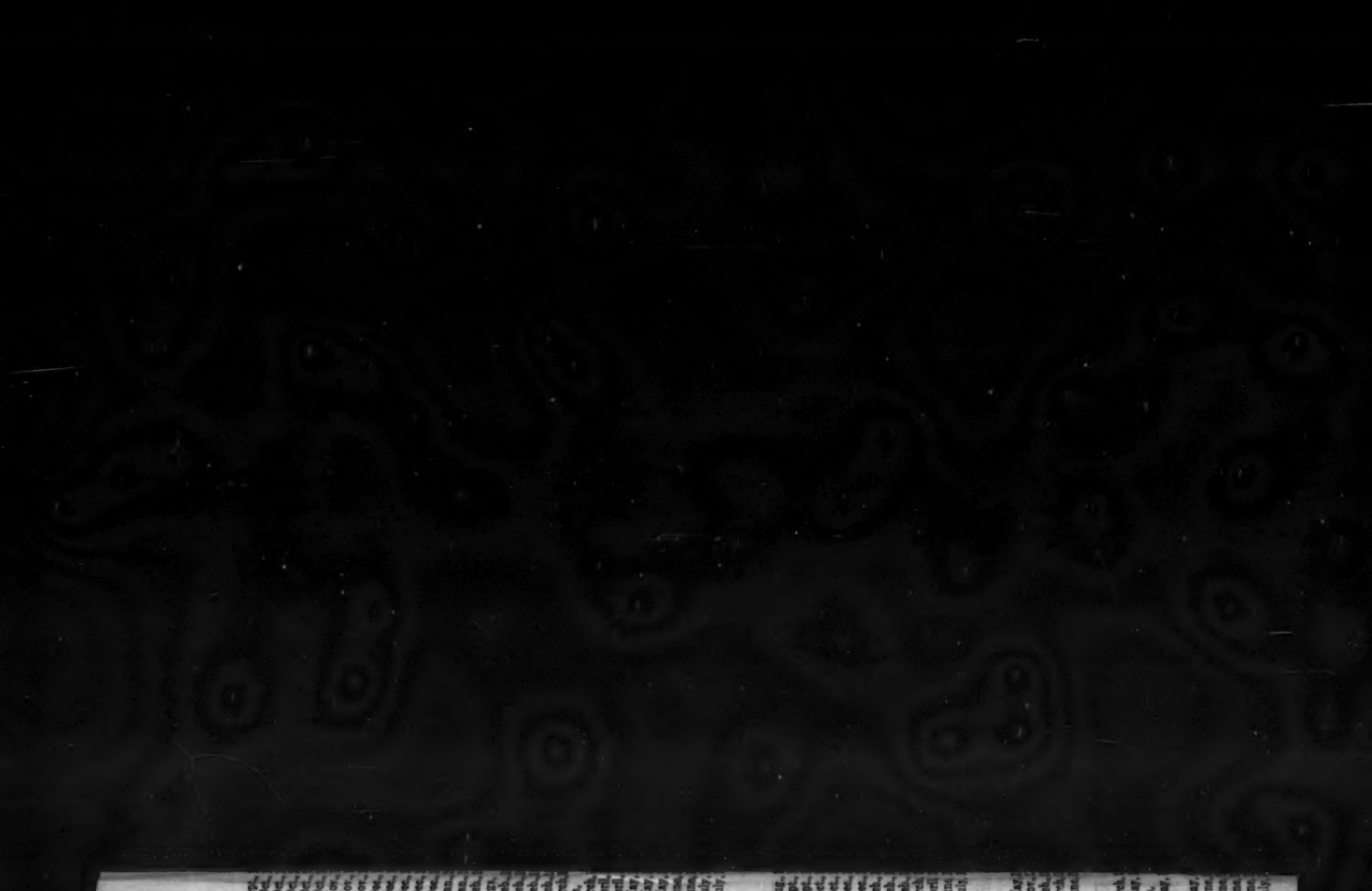

The Farmers Digest Announces A Scholarship Prize Contest

The Farmers Digest is offering a one hundred dollar ($100) scholarship to the winner of the contest.

The rules are as follows:

1. The contest is open only to boys who are members of a 4-H Club, and who will graduate from high school by July 1st, 1942.

2. Each contestant must submit an article of not more than 1500 words on some project undertaken by him in his 4-H Club work at some time during the past three years. The article should contain as many facts and figures as possible.

3. The article must be the original work of the contestant. It must be typed, double spaced on regulation typing paper measuring 8½" by 11". Only one side of the paper is to be used.

4. Each story submitted must be read by the county agent under whom the project was carried out and must be signed by him.

5. The 4-H Club Extension Service in Washington, D. C., will judge all articles, and their decision will be final.

6. The Farmers Digest reserves the right to publish any article submitted in the contest.

7. The Farmers Digest will pay one hundred dollars ($100) towards the further education of the author of the winning article. The money will be paid to the educational institution chosen by the winner and will be applied towards his expenses while there.

8. A one-year subscription to the Farmers Digest will be sent to each of the five boys winning honorable mention in the contest.

9. All articles must be postmarked not later than January 1st, 1942, and mailed to the Farmers Digest, Ambler, Pennsylvania.

The Farmers Digest

Presents Each Month Facts about Some Outstanding Agricultural Magazine

The Rural New-Yorker is a magazine devoted to the dissemination of news and information on all agricultural subjects.

The magazine is in its 91st year. Mr. Dillon, who has been publisher and editor for just 50 years, was a farm-bred boy. He knew farmers and farm needs. He resolved to publish only what was true and what he believed would be helpful and beneficial to the farmer and farm family. Much of his time, and the space of his paper, has been given over to championing the farmer against those who have wished to injure him.

The Rural New-Yorker is published and printed in its own building at 333 West 30th Street, New York City. Editor, John J. Dillon; Associate Editor, William F. Berghold; Managing Editor, W. W. Higgins, and Secretary and Advertising Manager, Wm. A. O'Brien.

The subscription price is 50 cents a year, or three years for $1.00. Subscriptions should be addressed to The Rural New-Yorker, 333 West 30th Street, New York City.

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